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Agriculture.

SEEDS AND WEEDS.

BY F. F. COLEMAN, Expert under the Pure Seeds Acts.

"In general, those weeds are most numerous which rise from seeds, and those most difficult to be extirpated which come from roots."—Thomas Hale, "The Compleat Body of Husbandry, 1756."

A seed may be described as a ripe ovule containing an embryo plant. The embryo is the essential part of the seed; the other structures are subsidiary to its nurture, protection, and germination.

Seeds are usually able to remain for months, or even years, in a dormant state, hardly distinguishable from death, except in their power of reawakening.

They may not be ripe on separation from the parent plant, and ripeness is not always coincident with readiness to germinate. In cereals it will be frequently noticed that during a wet harvest some grain germinates in the seed head; others may undergo a form of incipient germination which prevents or retards subsequent growth. Generally speaking, seeds are not ready to germinate until they have passed through a stage of apparent dormancy, during which period the enzymes or unorganised ferments contained in the seeds have time to do their work by preparing the reserve food material.

If Mauritius beans or Lucerne seed be dropped into water, and left to soak for a few hours, it will be noticed that some of them remain the same size and shape as when put in water. These are called "hard seeds," their seed coats being so impervious to water as to delay germination. It has often been stated that the thickness of the hard layer of the testa prevents the seed absorbing water; this, however, may be due to the amount of ash ingredients that the coat contains.

Seeds vary greatly in their powers of retaining life, some of the Leguminosæ, in particular those containing a large amount of hard seeds, are capable of germinating after several decades. Unfortunately, carelessly made experiments have given rise to many exaggerated statements as to the powers of vitality that seeds possess.

Subtropical and tropical climates are usually associated with high temperatures and excessive moisture, which gives rise to conditions causing rapid deterioration.

The principal factor covering the keeping of seeds in good condition is a low moisture content, and storage at a non-varying low temperature.

No matter under what conditions a crop may be grown, the resulting seed will contain impurities. If reasonable care has been given to the crop, up-to-date seed-cleaning machinery will easily remove any foreign ingredients that the seed may contain. The best of machinery, however, cannot make dead and non-germinable seeds grow, but the differences in the specific gravity enable many immature and light seeds to be taken out; at the same time, the sieves will separate the foreign seeds, be they weed seeds or seeds of a cultivated plant other than the kind that the crop represents.

Seed-cleaning machinery cannot make bad seeds good, but it does make good seeds better.

Given favourable conditions at the time of sowing, the farmer may find that his crop contains a considerable number of plants other than the kind that he wishes to grow, or he may find his seed has failed to make a stand, and his season and labour have been wasted. No one can afford to leave any doubtful point to chance, and it is but common prudence to ascertain the purity and germination of any seed that he has purchased before sowing it.

The best is the cheapest, whatever the price, and quality should be the one and only consideration. In order to form an opinion as to the quality of any seed, careful examination should be made of a sample drawn from the actual bulk. The purchaser should ascertain the maximum amount of—

(1) Dead and non-germinable seeds.

(2) Inert matter.

(3) Weed or other foreign seeds.

If the seller has a full knowledge of the article that he is offering, he can at once furnish this information, which can only be based on an examination of a large sample drawn from the bulk in his actual possession. In the same manner the buyer can only obtain accurate information as to the quality of the seed that he has purchased by the examination of a large sample, taken from the seed delivered and now in his possession. No reliance should be placed on the appearance of any sample drawn in any other way.

Unfortunately, the majority of both buyers and sellers cannot identify even the weed seeds of most common occurrence. These vary so much in size that a statement of the percentage present conveys no real idea of the number in one pound. One per cent. by weight means that the farmer sows with every pound of seed one-hundredth of a pound of weed seeds. Darnel and Oriental rocket are frequent impurities in Oats, and the approximate number of seeds contained in 1 per cent. would be 390 seeds of Darnel (*Lolium temulentum*), and 17,900 seeds of Oriental rocket (*Sisymbrium orientale*). Many samples of Oats contain 2 per cent. of Darnel; this means the sowing of 780,000 Darnel seeds with every 100 lb. of Oats.

Seeds constitute the most variable material that the farmer purchases, and weight for weight the most costly of his purchases. As the success or failure of a crop, or even succeeding crops, may be determined by the kind or condition of the seed sown, the importance of accurate knowledge of the article is essential.

An opinion as to the quality or condition of any seed should only be based on actual facts, revealed by an analysis conducted under uniform scientific conditions. This work is undertaken by the Pure Seeds and Stock Foods Branch of the Department of Agriculture. A leaflet giving information as to size of samples and other particulars can be obtained from the Under Secretary, Department of Agriculture and Stock, Brisbane.

SOME NOTES ON THE SOILS AND FOREST FLORA OF THE DIVIDING RANGE—NORTH OF ROMA.

BY H. I. JENSEN, D.Sc. (SYD.).

(Continued from November "Journal.")

An area of country containing representatives of all the same soil types as the stretch between Roma and Injune was investigated by the writer in the north-east of the Pilliga Scrub, in New South Wales. A comparison of the soil analyses was

made for that area, which will, no doubt, be found to hold also in the area under review. It is given below:—

Characteristic Timber.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.
Pine	0·50	2·23	·025	·049	·046	·076
Stringybark	0·71	2·81	·031	·060	·034	·062
Narrow-leaf Ironbark ..	0·65	2·12	·033	·089	·040	·064
Box-Buddah (Sandalwood)	2·25	4·98	·089	·257	·129	·111
Poplar Box	2·40	5·54	·081	·281	·115	·152
Silverleaf	2·21	6·71	·098	·316	·125	·228
Belah-Brigalow Gilgai ..	5·39	6·42	·070	·568	·194	·118

The first three—pine, stringybark, and narrow-leaf ironbark (*E. siderophloia*)—are characteristic of the silicious sandstone belts and indicate typically poor soils. The others are fair to rich soils and occur on shales and calcareous sandstones.

The heavy blacksoil plain, brigalow country, and brigalow-belar country occur on the cretaceous rocks north of Roma and Mitchell, and also in strips or belts in the Walloon series along the Injune line north of Minka, and along the Durham Downs road. In the Walloon series there are narrow brigalow belts in the Upper Walloon, as near Yingerbay, a large belt in the Middle Walloon, north of Orallo, and a very much greater belt in the Lower Walloon, along the Injune Valley, Myall Downs, and Durham Downs.

Excellent belah belts are met with between Orallo and the Dividing Range, and also along Injune Creek in the soldiers' settlement area.

The sandstones represented are mostly of the calcareous variety, yielding good soils. Poor soils are confined to a few narrow strips of pine country—one situated in the top of the Walloon, near the cretaceous border, another near Orallo, and some rough sandstone mountains at the head of Injune Creek.

So closely do the timbers and soils correspond with geological formations, that if a detail geological map could be prepared showing not only the main divisions of the Walloon series, but also the horizons, that map would be at the same time a geological map, a soil map, and a forestry map.

Having treated fairly lengthily of the soils between Roma and Injune, we can now discuss the soils of the other regions more cursorily, the principles having been explained.

THE MARANOA VALLEY.

Travelling up the Maranoa Valley from Mitchell, we meet with the same formations as between Roma and Injune, but there are two other formations well represented. One of these is the cretaceo-tertiary desert sandstone. This is, in the Mitchell region, a very silicious sandstone, and has very poor sandy soils, often coarse sand, with a barren country vegetation, including lancewood scrubs (*Acacia doratoxylon*), and open forest with yellow bloodwood (*E. trachyphloia*), budgeroo (*Lysicarpus termifolius*), woolly oak (*Casuarina inophloia*), rusty gum or sugar gum (*Angophora lanceolata*), Moreton Bay ash (*Eucalyptus tesselaris*), crooked gum (*E. dealbata*), pine (*Callitris glauca*), also the other poor country timbers already mentioned, and spinifex grass. This is pretty useless country, and is greatly in evidence about 15 miles north of Mitchell, as well as near Mitchell and Amby.

North of this, at Donnybrook and Forest Vale, we meet with good soils mostly, as between Roma and Injune, on Donnybrook and Forest Vale, giving brigalow, belah, sandalwood, box, and ironbark belts, with the same characters as those already described. North of Forest Vale and north-east at Toolumbilla and Womblebank we have the lower or calcareous Walloon belt with brigalow and belah scrubs. A beautiful belah scrub extends over a great area between Timor and Merivale, in the Dividing Range, corresponding with the belah scrubs on Injune Creek (the 56-mile) and Durham Downs.

Along the river itself are great apple-tree flats (*Angophora intermedia*), with beautiful rich sandy loams which could be made very productive by irrigation.

North of the Walloon area we get the Bundamba sandstones, which extend over most of Merivale, Crystal Brook, Eddystone Vale, Mount Moffatt, and Warrong. The soils are poor and sandy. The better flats are typical box (*E. populifolia*) country, but the rougher sandstone hills and ranges form pine country, Moreton Bay ash, sugar-gum country, and some silverleaf country answering to the description of country which these timbers have been shown to cling to.

It is fair grazing country as long as the cattle have plenty of room to "poke about," but would be very wretched if divided into small areas. It might, with

transport facilities, develop into very fair fruit and vineyard country, especially where the sandstones are felspathic, but it is, generally speaking, unsuited for farming. This poor belt is, approximately, 30 miles wide.

North of the Bundamba sandstone in the Main Dividing Range we get fairly large areas of fine basalt country on the northern portions of Mount Moffatt, Warrong, and Marlong Stations. This is first-class country, and would be as suited for cultivation as it is for grazing. Rich chocolate soils, merging into black on the flats, characterise the basalt. Coolibah, gumtop-box, and silverleaf ironbark are the main timbers. The basalt alluvials would make fine lucerne-growing areas, and the higher grounds would grow cherries and other fruits. The climate both of the Bundamba sandstone and basalt belts is that of high tableland country. The elevation is from 2,000 to 3,000 ft. above sea-level, and Stanthorpe fruits should thrive. The rainfall is much in excess of that of the plains country.

THE HEAD WATERS OF THE WARREGO.

From Killarney to Babbiloora, through the Boggarella district, we have formations, soils, and forest flora similar to those of the Walloon belts in the Orallo to Injune Creek districts, but the climate is more typical of the interior. From Babbiloora to Carnarvon Station we have the Bundamba sandstones, with their characteristic vegetation and sandy soils, already described in dealing with the Maranoa, and in the range at Carnarvon Station we have basalt country similar to that referred to in dealing with Marlong and Mount Moffatt.

The basaltic plains country at the head of the Warrego (Channing and Dooloogerah Creeks) is some of the most beautiful country in the State, and with railway facilities would be equally suitable for dairying and general farming. Its greatest defect is a remediable one—viz., the abundance of the beautiful, yet very harmful, tree zamia (*Macrozamia Moorei*). The prickly-pear has not yet reached this fine country, but is advancing in this direction, and will soon get a footing, unless checked.

THE TRIBUTARIES OF THE NOGOA.

The writer traversed down Buckland Creek to Nardoo and then across to the Nogoa at Nandowrie Peak, along the Nogoa to Vandyke Creek, up Vandyke, Coonah, and Freitag Creeks, and through the Springsure district.

Many geological formations exist in this region; hence the soils are varied. The run-off of the rainfall is very rapid, the country falling from 3,000 ft. above sea-level to 600 or 700 ft. above sea-level in from 10 to 30 miles. The streams are veritable canyons at the head, with high barren sandstone and basalt escarpments on either side.

Naturally, swift running streams deposit a great bulk of their sediments when the grade of the stream becomes less, hence the lower reaches of these streams are flanked by rather wide belts of alluvial, which, containing detritus from limestone, basalt, sandstone, shale, and other rocks, are exceedingly well-balanced and fertile soils.

In other respects the Nogoa tributaries are characterised by the same soils and vegetation that are usually found on the same classes of rocks in other parts already described, and only brief notes are essential. High up in the mountains we have basalt ranges and tablelands. The soils derived from the basalts are good; but the ranges are rough, the run-off of rainfall is rapid, and springs are very few. However, at the base of the basalt ranges springs are particularly abundant and of a permanent nature. The basalt country is mostly too rough and dry for agriculture, and too rough for grazing. The access to the tablelands is so steep that cattle seldom wander up, in spite of the rich carpets of mountain grass growing on them. The pastoralists are not anxious, either, to have their cattle in this region, since the zamia grows so thickly on the basalt ranges that most of the cattle feeding here get the rickets. The timbers on the basalts are mostly box (*E. hemiphloia*) and silverleaf ironbark (*E. melanophloia*).

Below the basalts we have the "Upper Bowen" sandstones. They occupy a belt of country bounding the Carnarvon Range basalts on the north. The soil is poor silicious sandy loam, which is very inferior pastoral country, except where basaltic detritus is intermixed through alluviation. The timbers in this region comprise spotted gum (*E. maculata*), crooked gum (*E. dealbata*), Moreton Bay ash (*E. tesselaris*), sugar gum (*Angophora lanceolata*), ironbark (*E. decorticans*), pine (*Callitris glauca*), yellow bloodwood (*E. trachyphloia*), budgeroo (*Lysicarpus*), stringybark (*E. acmenioides*), oak (*Casuarina inophloia*), dogwood (*Jacksonia scoparia*), cherry (*Exocarpus cupressiformis*), with a variety of wattles, among which *Acacia Bancrofti, A. doratoxylon, A. Cunninghamii* are very plentiful. The next belt met with to the north is the coal measures and limestones of the "Upper Bowen" formation. The soils of these coal measures are variable, inasmuch as we have strata of silicious rock and shale alternating with calcareous sandstone and shale, but on the

average this belt is good pastoral and agricultural country. The heavier calcareous belts of soil have typical calciphile vegetation—namely, brigalow scrubs with belar, wilga, and other calciphile trees. Some of the limestones of the "Upper Bowen" formation are covered with blacksoil plains devoid of timber, open plain type. These are richly clad with nardoo, saltbush herbage, and fine fodder grasses. Plains of this kind are seen at Nardoo Station, east of Mount Sunday, in the Blue Hills region, on Vandyke Creek and Spring Creek, near Mount Sterculius, on Wealwandangie Head Station, and elsewhere. With irrigation these black soils grow magnificent vegetables, as was instanced by the station garden at Wealwandangie. The Bowen limestones and calcareous shale soils contain much free "copi" (gypsum) which is the best neutraliser of excess of alkali. Hence the alkali trouble which is so great on irrigated lime soils in our western interior is not felt here; the rainfall and removal of alkali by leaching are also greater. The "Upper Bowen" coal measure and limestone belt in this area is consequently a fine belt of agricultural land, probably second to none in Queensland. The "Middle Bowen" formations, which form the next belt to the north, are composed mainly of sandstone and conglomeratic sandstone, with a coal measure belt intercalated. The coal measure portion is fair land, but contains little pure limestones. It is not noted for open plains or brigalow scrubs, but the coal measures have abundant bloodwood (*E. terminalis*), silverleaf ironbark (*E. melanophloia*), box (*E. populifolia*), and timbers like those of the Walloon coal measures north of Roma. The soils are good in all mineral plant food constituents.

Now, the conglomeratic sandstones of the "Middle Bowen" formation in this area and in other areas to be mentioned later are very much better in soil and stock feed than the sandstones of the Bundamba and Upper Bowen formations. There is much detritus derived from granite, slate, porphyry, and even of limestone in the sandstones of this belt. The soils, though mechanically gravelly sandstone soils, are richer in plant food than most other soils derived from similar massive sandstones. This belt is, therefore, fairly well suited for small stations and large grazing farms. The timbers of this belt include, conspicuously, spotted gum (*E. maculata*), yellow jacket (*E. Watsoniana*), pine (*Callitris robusta*), river red gum (*E. rostrata*), Moreton Bay ash (*E. tesselaris*), cabbage gum (*E. papuana*), and bloodwood (*E. terminalis*). The alluvial soils throughout the Nogoa quadrant are splendid. The characteristic timber is coolibah (*E. microtheca*).

THE TRIBUTARIES OF THE BROWN RIVER.

It suffices to state that the soils met with and the timbers they support are identical with those of the Nogoa, except that, in regard to timbers, several timbers of a coastal type creep in and mingle with the western timbers on the Brown River basin. That mingling of inland and coastal floras, which is first well marked in the vicinity of Rolleston, becomes very strongly marked in the country between the Expedition Range and Taroom. At the head of the tributaries of the Brown River we also meet with the calcareous shales of the "Ipswich" coal measures, with beautiful black and chocolate soils of a heavy nature, clad with brigalow, belah, wilga scrub, and the Ipswich formation sandstone, a yellow sandstone, rich in felspathic detritus, hence good in potash, on which we have open forest with box species (*E. populifolia, E. cambageana, E. hemiphloia*), ironbark (*E. melanophloia* and *E. crebra*), zamia, &c. The belar and brigalow scrubs on the black soils of Ipswich formation in this area are the specially favoured habitat of the prickly-pear, all varieties.

The coal measure belt of the "Upper Bowen" in the Brown River basin occupies comparatively low ground—usually only 600 to 800 ft. above sea-level; hence much of it is alluviated with wide stretches of magnificent alluvial soil of mixed origin, reaching usually a thickness or depth of 40 to 50 ft. The alluvials along Consuelo Creek, Carnarvon Creek, Arcadia Creek, the Brown River, and Moolayamber Creek, in this belt, are superior to anything I have seen elsewhere. They form coolibah and ironbark country. The silverleaf ironbark, which south of the Carnarvon Range favours stony ground with shallow soil, becomes in this region a denizen particularly of deep alluvial soils. This, of course, depends absolutely on the fact that silverleaf ironbark must have a sufficiently calcareous soil and good drainage to live. It can always be taken to indicate those soil properties. A limestone soil apt to get waterlogged does not suit it any better than a soil devoid of lime.

The soils of the "Upper Bowen" coal measures and limestones in the Brown River basin are very saline in nature. Saltbush, marsh, couch grasses, and other grasses which like a saline environment, predominate. The prickly-pear is spreading fast. The pear is in itself an indication of salinity, so much so that I am seriously considering the rate of the spread of prickly-pear a gauge of salt content in a formation, and hence a means of locating likely oil country.

The saline plains of Warrinilla would be fine dairy country if subdivided. Unfortunately, the pear is here spreading fast.

(TO BE CONTINUED.)

Pastoral.

PRINCIPLES OF STOCKFEEDING—I.

BY CUTHBERT POTTS, B.A., Principal, Queensland Agricultural College, Gatton.

[The first of a series of papers setting out, as simply and practically as possible, some of the main principles of stockfeeding. Mr. Potts does not propose to delve deeply into the science of feeding, and his object is, rather, to use the results of scientific investigation in an effort to show how stockfeeding may be made more profitable.—ED.]

For us in Australia the study of the principles underlying the proper feeding of stock is more important than for those living in older countries which have years and years of stockfeeding experience to draw on. In many of these older countries, with their well-established rotations of crops—for example, the North of England and Scotland—long experience has taught men how to feed stock well merely by the process of trial and error. Now, in such countries a boy brought up on a farm learns how to feed stock without knowing why. He learns by imitating his elders. Even so, the study of the scientific principles underlying stockfeeding has been of advantage to these countries of long practical experience. How much greater must the advantage of this study be to us who have no such practical experience of generations to draw on, to us in Australia who really do not know how to feed stock?

Before proceeding to a description of what a feed consists of, let me try to give a quick example, illustrating that there is more in feeding than just filling an animal's stomach. Probably most of you in front of me are thinking or muttering that you know this, yet I venture to say that if most of you will just stop and think about the hand-feeding of stock, as you know it to be carried out by yourselves and your neighbours, you will admit—(*a*) That there is little, if any, systematic storage of fodder to feed with; (*b*) that, for cattle in particular, there is little feeding resorted to until dry conditions have so far advanced that the stock are poor, or even at starvation point; and (*c*) that when this state is reached, the object of the feeding is merely to keep the stock alive, and for this purpose almost anything is seized upon to feed—anything which the stock will eat. In brief, it is merely a question of getting something into the animal's stomach which will maintain life, but no consideration has been given as to whether the feed given is really being used as effectively as possible, while certainly no thought is given as to whether some modification of the feeding were possible whereby the feeding could be rendered a profitable undertaking.

However, for our example—

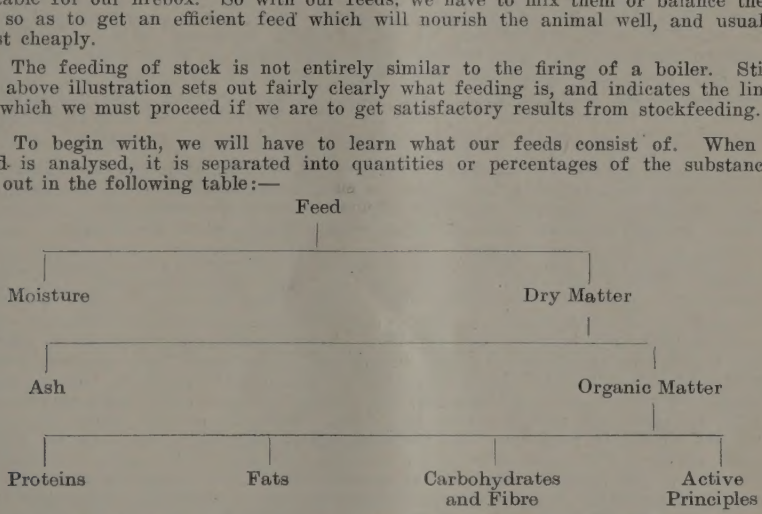
Suppose you had a steam boiler and 1 cwt. of coal. The amount of steam you could get by burning the coal would depend on a number of points. You could not expect to get good results if the boiler tubes were dirty, the chimney stack broken and full of holes, and the boiler plates covered with scale inside. Even supposing these points were in order, you could not get the best results unless the coal were fed to the firebox carefully and systematically, so as to maintain an even high-temperature fire. It is much the same with feeding stock. First, the animal to be fed must be worth the feeding, or else feeding cannot pay. Second, the feed can be given wisely or badly, resulting in good or indifferent results accordingly.

But let me take the steam-boiler example a stage further. Suppose that you have ten units of fuel, each weighing 1 cwt. and each having been got from some different source, so that one unit might be hard, clean coal, another dirty, slaked coal, a third good, solid wood, a fourth semi-decayed wood which is damp, and so on. If the boiler is fired with each of these different fuels separately, each will give a different steaming value. To know the weight of fuel used, therefore, is not sufficient. We require also to know the quality of the fuel. Knowing this latter, we would be in a position to estimate the value of each different fuel or to say how much we would be willing to pay per ton for each class of fuel. In truth, if we want to produce steam cheaply, the most important thing for us to know is the quality of the fuel. In much the same way feeds vary in quality, and we have to know the quality of our feeds if we are to feed stock successfully. With our boiler we can imagine a fuel so bad that, no matter how much we use, we

cannot keep up steam. In fact, we can choke up the firebox by using too much, but we cannot get a hot fire. Such a fuel is expensive, no matter how little we pay for it. In the same way we can have a feed which is of such poor quality that it will not nourish the animal, even though the animal can be persuaded to eat its fill of the feed. To use such a feed is mere waste of money. Again, a fuel may be so good that, even using a little of it (sufficient has to be used to keep a bed in the firebox) gives too fierce a heat, with the result that a great deal of heat is lost up the chimney-stack. It is the same with feeds for stock; some feeds are so rich in quality that quite a little of them would nourish the animal, but this amount would be too little to comfortably fill the animal's stomach and so satisfy its hunger, while if sufficient were fed to satisfy the hunger-craving, *i.e.*, to fill the stomach, a great deal of useful nourishment would be wasted by passing through the animal as dung. With our fuels we would have to blend them so as to get one suitable for our firebox. So with our feeds, we have to mix them or balance them off so as to get an efficient feed which will nourish the animal well, and usually most cheaply.

The feeding of stock is not entirely similar to the firing of a boiler. Still, the above illustration sets out fairly clearly what feeding is, and indicates the lines on which we must proceed if we are to get satisfactory results from stockfeeding.

To begin with, we will have to learn what our feeds consist of. When a feed is analysed, it is separated into quantities or percentages of the substances set out in the following table:—



First the feed is separated into moisture and dry matter. This is done by taking a known weight of the feed and placing it in an oven at the temperature of boiling water, and drying it until there is no further loss of weight. The loss in weight is the moisture present, while what remains is the dry matter. It is of importance to know the percentage of moisture in a feed, because the water present is of no value for the nourishment of the animal. The water in the feed is readily absorbed by the animal system, leaving the dry matter in the stomach for digestion. The animal gets its nutriment from this dry matter. But water in a feed will give it bulk. Hence, when an animal eats largely of moist succulent feeds it quickly gets that satisfied feeling of a full stomach, and stops eating. Soon afterwards, however, when the water of the feed has been absorbed by the animal's body, there remains in the stomach only a comparatively small amount of dry matter, insufficient to comfortably fill the stomach, and hence there results an empty void-like feeling. The small amount of dry matter thus remaining is not sufficient for a proper process of digestion, and, further, it may not be enough to properly nourish the animal. When we consider our own feed, we get a parallel case when we fill ourselves, say, with porridge. A couple of plates of porridge will send us from the breakfast-table feeling full. But a couple of hours afterwards this full feeling will be replaced by a feeling of emptiness. It is the same with stock when their feed contains too much moisture.

In truth, it is necessary to so mix our feeds that when the animal has satisfied its hunger it has taken into its stomach a sufficient quantity of dry matter.

In regard to this, some of you may state that you have fed cattle on green barley, *i.e.*, a wet, succulent feed. But I must remind you that this is not the only feed the cattle get. They are allowed to run in the paddocks, and there they pick up a considerable amount of dry grass, thus correcting the amount of dry matter.

Again, dairy stock do well on green grass. But here, again, you must recognise that the cattle, as they graze, select their own feed and adjust their ration in a manner quite beyond the power of man.

The second stage in the analysis of the feed divides the dry matter into mineral ash and organic matter. To get this, the dried feed is burnt until there is no further loss of weight. The dry matter that burns away is the organic matter, and what remains and will not burn is the mineral ash.

The organic matter contains the substances which nourish the animal, and we will consider this later. At present, we will consider the mineral ash. The animal obtains from this ash several substances which are necessary for its life. First there is the material to make the bony structure, *i.e.*, the lime phosphate (calcium phosphate) and lime carbonate (calcium carbonate). Next there is the iron which is required for the animal's blood. Again, chlorides are present in the ash, and these are necessary for portion of the digestion process.

With the exception of common salt, which we give stock as a lick, the ash of mixed feeds usually contains sufficient mineral ash to meet all the needs of the animal. We know, however, that on some country stock make good bone and thrive well, while on other country they do not. In fact, we know of some country on which young stock will not develop sound bone and on which older stock will gradually waste out their bony framework. This is undoubtedly due to some deficiency in the ash content of the feed, for on this poor country where the animals suffer from what may be termed a "*bone starvation,*" a correction can be made by feeding one of the calcium phosphates to the stock, *e.g.*, crushed bones.

Let us now consider the organic matter. In the analysis this is divided into several classes of substances, the chief of which are proteins, fats, carbohydrates, and fibre, and active principles. Each of these classes of substances plays a different part in the feeding of the animal, and this we will proceed to describe.

Proteins.—These are highly complex chemical compounds, and they all contain nitrogen. They are the most important portion of the nitrogenous part of the feed. Proteins are always associated with life, whether plant or animal. They might be termed the "life compounds." Typical examples of proteins are white of egg, casein in milk, the lean portion of meat. Proteins are manufactured in plants. They are not manufactured by the animal. Animals obtain their protein matter directly or indirectly (*i.e.*, by eating animals which feed on plants) from plants. Plants, however, do not contain large quantities of protein. The plant structure is chiefly composed of carbohydrates and fibre. Animals, on the other hand, are composed chiefly of proteins. The muscular tissue, hair, skin, nails, brain, are all protein matter. The main value of the proteins in a feed is to supply the material to build up the protein tissue of the animal. No other substance can take the place of the proteins. As the animal wastes an amount of tissue each day, just in the ordinary process of keeping alive, it is necessary that an animal should receive in its feed each day a definite amount of proteins if it is to remain alive and healthy. But if the animal is called on to work or produce milk, say, or grow, which is an increase of body tissue, or do anything in excess of merely remaining alive, so the demand for proteins in the feed is increased, being greater the greater the demands made on the animal.

If an animal is fed no proteins at all, it will remain alive for some time, drawing on the protein substance of its own body. An animal, however, cannot suffer a great reduction of its protein substance. It would soon become weak and languid, and would finally die by just fading out.

It is possible, therefore, to have what we might term "protein starvation." That is, we might be feeding ample feed as regards quantity, but this food might contain so little proteins that the animal, even though it might be fat, would die. We sometimes see this effect in children who are fed too much starchy food. They get fat and flabby, but are not healthily strong. Proteins, therefore, are the flesh and tissue builders for the animal, but, besides this, proteins can be converted into body fat (*see* below), or may be used for the production energy (also *see* below). It is important to note that the amount of proteins in plants increases up to the time when the seed begins to set. Up to this time the proteins are distributed throughout all the plant, but as the seed sets the protein matter is withdrawn from the plant and is concentrated in the seed. You can understand, therefore, why we cut a crop before the seed sets if we want to make it into hay. The best time to cut each crop varies with the kind of crop; still, the above statement holds good in its generality. Again, we should expect seeds generally to be rich in proteins, and this is so, though different seeds vary in regard to their protein content.

Fats.—The amount of fat and oil in plants is not generally large, though some seeds—for example, linseed and cotton seed—contain large quantities.

Fats are compounds which do not contain nitrogen. When digested by the animal, the vegetable fats are converted into body fat for the animal, this body fat being distributed throughout the body tissue.

Animals are able to stand big variations in the amount of body fat stored in the body. When we speak of an animal being lean we merely mean that there is very little storage of body fat. When an animal is fat and topped up, body fat is intermingled throughout the body tissue. It is this fat throughout the tissue which makes the meat tender. Thus we see we can have a third kind of starvation, namely "fat starvation."

It is fat starvation which is most obvious, because it at once appeals to the eye in the condition of the animal.

From the animal standpoint, storage of fat is merely the storage of energy in the system which can be drawn on under adverse conditions. Ultimately, therefore, the fat is converted into energy to enable the animal to move and work and maintain its body heat.

One pound of fat has about two and a-quarter times the heat or energy-producing value of 1 lb. of proteins, or 1 lb. of either carbohydrates or fibre.

The chief value of fat in the food is to produce body fat in the animal, but the fat may be used directly for the production of energy for the animal.

We do not usually feed large amounts of fat, because fatty foods are too heating.

Carbohydrates and Fibre.—There are many kinds of sugars and starches and plant fibres. All of these various substances are classed under this heading of carbohydrates and fibre. The sugars and starches, especially when pure, are readily digested and assimilated by the animal. With plant fibre, however, we have a big variation. Thus the fibre in young, green plants is fairly readily digested, while the fibre in fully matured plants—for example, in wheaten straw—is only partially digestible. Generally speaking, the more fibre a feed contains, the less digestible all the ingredients of the feed, both proteins, fats, and carbohydrates.

The carbohydrates and fibre form by far the largest part of the feed, because plants are composed chiefly of these substances. The chief function of this portion of the feed is to produce energy for the animal—energy for muscular action and the heat for the maintenance of the animal's body temperature. Beyond this, however, the carbohydrates and fibre can be converted into body fat by the animal, though the fat formed from this part of the feed is generally softer and more flabby than body fat produced from the fats in the feed.

It has been mentioned that all the fibre is not digested. This is of importance for the process of digestion. This indigestible matter keeps the stomach and intestines distended, and is the solid matter on which the feed is ground up to a fine state, so that it can be better acted on by the digestive juices. Cattle and horses and sheep require comparatively large quantities of indigestible fibre in their feeds —the cattle and sheep because of the nature of their digestive system, with its four stomachs; the horse because of the peculiar formation of its teeth, which has been developed for the special purpose of grinding up hard, dry feeds. On the other hand, pigs and human beings cannot manage feeds containing much indigestible fibre, while much the same applies to poultry. Poultry, however, have a special arrangement to assist in grinding their feed, an arrangement practically replacing the teeth of animals. This is the gizzard, which contains small stones and grit through which the feed, softened with an inflow of digestive juices, is worked and rolled until it is in a fine state of subdivision.

Active Principles.—The amount of these substances in any feed is very small, and the percentages are not shown in the analysis. Our experience, however, is generally quite sufficient to give us sufficient information with regard to this portion of a feed. Thus we know that certain feeds are laxative in their effect, *e.g.*, bran and linseed meal; other feeds are binding, *e.g.*, cotton-seed meal. Again, sorghums are poisonous to cattle at a certain stage in their growth. These differences in the feeds are due to the presence of small quantities of substance which are here grouped under the term "Active Principles." They are mentioned merely to impress on you that we have to have a knowledge of the general effects of each feed on the animal system. We have to modify the use we make of a feed in accordance with this knowledge.

Digestibility.—In the above discussion we have dealt with the composition of a feed as it would be determined by a chemical analysis. During the discussion on the fibre content of the feed, it was indicated that a part of the food was not digested. That is, that a part of the food was not dissolved in the process of digestion and absorbed by the animal system, but remained in its solid state, to be ultimately voided as dung.

Each feed differs as to the degree to which it is digested, but to determine this degree we can no longer depend on chemical analysis. Instead, we have to carry

out feeding tests with animals. The degree to which a feed is digested is called the digestibility of the feed.

It is important to know the digestibility, because it is only that portion of the dry matter of the feed which is digested and absorbed which can be utilised for the nourishment of the animal. As stated above, the undigested portion of the feed passes through the intestines and is voided as dung.

A great deal of work has been done in this matter of feeds and feeding, with the result that we now have the chemical analysis of practically all the feeds, and their digestibility has also been determined by feeding tests with animals. Combining these two, you will find in all books on feeding tables of feed analysis under the headings somewhat as follows. A few analyses are shown to illustrate the point.

IN 1 LB. OF FEED THE QUANTITY OF :—

Name of Feed.	Dry Matter.	DIGESTIBLE.				Ratio.
		Proteins.	Fats.	Carbo-hydrates and Fibre.	Total Nutrients = Proteins + Fat × 2¼, + Carbo-hydrates and Fibre.	
Maize Silage	·264	·014	·007	·142	·172	1:11·3
Lucerne Chaff	·918	·105	·010	·402	·530	1:4·0
Wheaten Straw Chaff ..	·904	·008	·004	·352	·369	1:45·1
Maize (Grain)	·894	·078	·043	·668	·843	1: 9·8
Bran	·881	·119	·025	·420	·595	1: 4·0
Linseed Meal	·902	·302	·069	·320	·777	1: 1·6
Green Lucerne	·282	·036	·009	·121	·166	1: 3·6

COMBATING THE BLOWFLY.

OFFICIAL REPORT ON THE SPECIAL EXPERIMENTS AT DALMALLY.

Mr. W. A. Russell, of Dalmally, reporting to the Chairman, Special Blowfly Committee, Institute of Science and Industry, Brisbane, states:—

"Since my last report, dated 27th June, the work has been proceeding as usual. The fly has been more active than has been the case since the inception of the experiments, but the losses are now able to be greatly minimised, and generally can be kept at a reasonable figure.

"The results of the experiments, extending over three and a-half years, are most gratifying, and if the full results of this work could be published, it will be the means of saving the pastoral industry a large amount of wasteful expenditure. In this I refer to the number of expensive and absolutely useless specifics that are on the market, claiming to protect sheep from the ravages of the blowfly pest. Experiments will show that, generally speaking, they are useless, and give no protection at all, and, on the average, cost about 2d. to 3d. per sheep and as high as 1s.

"The experiments here have always been carried out with a careful consideration to the commercial possibility of dealing with stock in numbers, and so far the results have been gratifying, and the cost reasonable.

"The results show that all specifics which have to be hand-dressed, and the sheep cleaned up with shears before applying, have failed; and that so far one thing is of any value in dealing with the pest, and that is arsenic. This must be in a soluble form, and it has been found that it can be used with safety on sheep, young and old, shorn and woolly. I have increased the strength from 0.6 to 1 per cent., and up to this point the result has been the greater the strength the greater the efficiency. I do not think, from the results, that there is any need to go beyond this strength, as at 1 per cent. it kills all maggots within six hours. As soon as it is jetted on the sheep the maggots get uneasy; those that can get away drop off the sheep, and the others die in the wool. The sheep then has rest, can feed, and recovers. The examination of the sheep shows that the arsenic, even in the strength of 1 per cent. (which means 10 lb. of arsenic to 100 gallons of water, with of course the necessary soda ash or soda in order to dissolve the arsenic), has a healing effect on the sheep.

"The difficulty, so far, is to fix the arsenic in the wool, and so retain immunity from further infestations, which, however, as a rule are very slight if the jetting is properly done. I advocate the use of arsenic and soda only. The presence of sulphur is of very little value, if any, as a deterrent of the fly trouble; maggots will work in sulphur, but they cannot stand arsenic.

"Tests are being carried out in the laboratory as to what percentage of arsenic will kill the maggots. So far I have found that a solution of 0.125 is fatal to them, but it is rather slow, and if only jetted on in weak solutions, as the sheep dry, the percentage seems to disappear and is not effective.

"The analysis of the wool has been carried out in Brisbane by the Government Analyst, and it is due to the results obtained by him that we have been able to increase the strengths used. Graphs also have been prepared, and are, I expect, available to you. With the more recent results these graphs are instructive, and when we are quite certain of the percentage of arsenic which gives protection and immunity, this will also be included in the graph.

"Many districts suffer from fly attack over the body of the sheep, as well as the breech, so I have tried dipping in arsenic, and so far have used it up to 0.5—viz., 5 lb. of arsenic to 100 gallons of water, with no harmful results. I am increasing the strength to see what can be safely used; but owing to the possible loss of sheep in swimming them in these mixtures, only very few can be done at a time, and the results watched. These experiments I am now proceeding with, and you will have a good many of these results in my next report."

On the subject of arsenic and oil, the report proceeded: —

"It is not possible to dissolve arsenic in oil, but a good many experiments have been carried out with oil with arsenic in suspension, and these are still under observation. A very cheap oil has been found, and the cost will be very reasonable. This work is not far enough advanced yet to offer any opinion on, except that results so far have been most encouraging.

"I think that the main experiments for the coming year should be jetting with arsenic, and dipping in arsenic, as outlined in my report to you of 27th June, together with the trials of arsenic and fat, and arsenic and oil, which, so far, has proved very effective.

"The analysis of wool, I think, should be continued, and I will, as before, send samples and specifics to Mr. Henderson, unless otherwise directed by your committee."

MR. W. G. BROWN'S REPORT.

Mr. Brown, State Sheep and Wool Expert, and a member of the State Committee, in the course of his report to the Chairman, said:—

"In accordance with the instructions of your committee, I proceeded to Dalmally on the 5th October, inspected the 750 stud sheep specially used for experiments, and append herewith details.

"*Scope of Experiments.*—The scope of the experiments for the year 1921 was designed to test such of the specifics as had been found at least useful during the past three years at Dalmally, not only as to their efficacy, but from the commercial side—that is, their relative expense of operation.

"*Discussion of the Analysis.*—Taking the analysis, it will be seen, first, that with two exceptions, No. 2 in Group 1 and No. 2 in Group 3, the infestations are pretty nearly the same for all specifics. No. 1 in Group 1 was a mixture of arsenic and oil in the proportion of 0.5 per cent. of arsenic. This gave the lowest infestation of all specifics, 35 sheep. No. 2 in Group 3 gave 37 sheep infested, the arsenical contents being 1 per cent. in the jetting solution. The controls, which were untreated, naturally gave the highest number of infestations—*i.e.*, 67. Fifty sheep being used in the trials of specifics.

"Of the 750 sheep used in the experiments, 16 died from various causes, 3 only of which deaths were due to flies. It will be noted that the sheep were jetted on the 26th, 27th, and 28th January, 1921, and the 1st, 2nd, and 3rd of February, 1921. Consequently there was a period of eight months covered by these experiments.

"It will also be noticed that the first cases of infestation were observed on 5th April, about two months after treatment, but they were comparatively few to 1st July. From then onwards the infestations became increasingly greater in numbers. This, in the light of the fact that the arsenic disappears rapidly after application, is only to be expected.

"*Bad Fly Season.*—Although the flies have been very bad since February, serious infestations did not occur until July, a period of four months since the animals were jetted.

"*Amount of Specifics Used.*—The specifics were mixed and used by me personally, and the number of sheep per gallon used was about ten.

"*Infestation Proportions.*—In further discussing the analysis, it will be seen that of the 700 plus controls untreated, a total of 795 infestations were found. This shows that sheep were attacked more than once. The exact number attacked was 473, leaving a balance of 277 sheep which had not been attacked at all over the period between jetting and shearing. I carefully inspected all the sheep as they were shorn, and could see no difference between those which had been infested and those which had not, as far as constitution, breeding, or quality of fleece was concerned.

"*Rainfall.*—The rainfall over the whole period from 26th of January until 9th October is as follows:—February 66 pts., March 312 pts., April nil, May 130 pts., June 427 pts., July 841 pts., August 101 pts., September 77 pts.; total, 1,954 pts. This rainfall is considerably above the average for the period under review, and will probably account for the constantly decreasing amount of arsenic which was found in the wool as analysed by Mr. J. B. Henderson, Government Analytical Chemist, which was submitted to him periodically by Mr. Russell. Doubtless the wet season and the warm winter will account for the very great prevalence of the flies over such a prolonged period. At present writing, I have never seen the flies so numerous or so deadly: this in spite of so few dead sheep to be found in such a prolific season for herbage and grass. The whole flock on Dalmally is in splendid fettle.

"*The Sheep Experiments Again.*—In further reference to the analysis, it will be seen that the numbers of sheep to each specific, only a comparatively small number (50) was used. The greater experiments, and the ones to which I attach the most importance, were made on very much larger numbers. I shall not give close details such as the Field Book furnishes, but shall give an outline of the operations.

"*Experiments with Larger Numbers.*—No. 1: 1,600 ewes due to lamb on 18th March, were jetted with a solution of 0.6 per cent. of arsenic, soda ash and water being the solvents. On 24th May 2 per cent. were found blown, and dressed. There had, by then, been a drop of 76½ per cent. of lambs. Two per cent had died from various causes, and a small percentage of lambs had been attacked by flies. No. 2: 1,335 ewes, due to lamb on 18th March, were jetted with a solution of 0.8 per cent. arsenic in the solution. Lambing was 60 per cent., 6 per cent. were struck, and 2 per cent. were dead or missing on 27th May. No. 3: 2,680 ewes jetted with a solution, used at a strength of 0.6 arsenic. These sheep were maiden ewes, and dropped 50 per cent. of lambs; 19 per cent. were found blown, mostly very lightly. Two per cent. were dead or missing. No. 4: 1,780 ewes jetted with a solution on 27th May at a strength of 1 in 20 of water. Arsenical strength not known. Nineteen per cent. were found blown on 8th June. A percentage of 40 per cent. of lambs. No. 5: 575 ewes were jetted on the 31st May, with a solution equal to 0.8 per cent. arsenic. These ewes had been jetted three and a-half months previously. On 15th June no fly attack had occurred since jetting. Out of 1,800 ewes in this paddock only 3 per cent. were found blown, the lambing being 76 per cent. No. 6: 325 ewe weaners, seven months old, jetted on the 3rd September, with 1 per cent. arsenic; examined by me on the 11th October, and were found to be blown to the extent of only 2 per cent. The flies attack ewe weaners first in a mob of sheep, and as the pest is now at it very worst since operations began, this is a most excellent record.

"*Losses from Flies through the Year.*—Mr. Russell assures me that in this very bad season for flies his losses have been almost negligible, less than 4 per cent. in lambing ewes, from all causes, loss from flies less than 2 per centum.

"*Are Some Sheep Immune from Flies?*—A question which appears to me should be thoroughly investigated is: Why are there any sheep in a flock not attacked when flies are so numerous? In the case of the 700 stud ewes treated here, plus 50 controls untreated, last January 473 were blown, many badly, and 277 were quite untouched. There were 795 infestations on 473 sheep. Reasoning by analogy, it is known that in every herd of cattle on tick-infested country there are individual animals which do not carry ticks. May not a similar immunity be enjoyed by sheep from fly infestation? This should be a matter for serious investigation by your committee. It should not be a difficult matter to obtain, from a fly-infested flock, members which do not appear ever to be attacked by flies. It seems to me that 750 sheep running together in the same paddock in the worst fly season we have seen, should all have been struck sooner or later in the eight months they have been exposed to infestation.

"FUTURE OPERATIONS.

"*No. 1 Experiment.*—After all the sheep were shorn we decided that a hitherto highly successful experiment should be carried on further, so that the first which was conducted on only small numbers, should be proved by the second on much greater numbers (say, 3,000 sheep). We put before you our reasoning. According to

analysis, arsenic used on sheep, in the proportions we have used, will disappear or become ineffective in a comparatively short period, not more than two or three months. In an abnormally wet year, such as this has been, it is probable that the poison has been washed out of the fleece. We aimed at fixing the arsenic in the wool for a longer period. Tallow sets hard, and flies will not blow it; therefore we warmed tallow, adding a little crude oil and arsenic. This mixture sheds water when it sets. We took 325 ewe weaners and applied such a mixture in the proportion of three-quarter gallons melted tallow, 2 pints crude oil, and 2 oz. of arsenic. This mixture was applied warm in the form of a swab on the breech of the animal. A few days in a bad season for flies, such as this, will show us what value this process possesses.

"*No. 2.*—Another experiment now in operation is the use of crude mineral oil in which arsenic is in suspension to the extent of 1 per cent. arsenic. This will be swabbed on the breech of 1,000 maiden ewes, the most susceptible of all sheep to fly attack. Mr. J. B. Henderson, Government Analytical Chemist, is now trying out a theory of his, in the direction of suspending arsenic in mineral oil. When he is able to give us the method this will be used on 2,000 or 3,000 ewes.

"*No. 3.*—Mr. W. A. Russell desires to jet about 500 ewe weaners with oil alone. He has found an oil which makes the experiment, if successful, the cheapest method on the market. Not more than 1d. per head will be the cost over the whole year."

CONCLUSIONS.

Upon this data Mr. Brown arrived at these conclusions:—

"It is certain that if a jetting solution containing not less than 0.7 per cent. of arsenic be used, then ewes especially will be immune during lambing time (a period of from eight to ten weeks).

"*Arsenic.*—Although at first I was very dubious about using arsenic in comparatively strong solution as an application to minimise fly trouble, I am satisfied now that it can be used at a strength of 1 per cent. as a jetting formula with perfect safety to the animal, and with excellent results as a preventative against the fly. Mr. Russell has been fearless in its application in strong solution, and has, besides, tried out many specifics of which little was known. I regret to say that on several occasions he has lost sheep."

INFESTATION ON GROUP SERIES.

Following are the details of the analysis which Mr. Brown discusses in the course of his report:—

	Apl. 5th	Apl. 12th	May 1st	May 9th	May 13th	Jne. 6th	Jne. 14th	Jly. 1st	Jly. 20th	Aug. 3rd	Aug. 17th	Sep. 1st	Sep. 16th	Shorn Oct. 5th
Group 1—														
No. 1 ..	1	1	1	0	1	2	4	5	6	3	7	9	12	52
No. 2 ..	0	3	0	0	2	1	3	4	3	5	4	4	6	35
No. 3 ..	3	1	1	2	—	1	3	7	8	2	6	16	8	58
No. 4 ..	2	4	3	0	—	1	3	6	5	2	6	12	10	54
Group 2—														
No. 1 ..	1	1	1	0	—	2	2	4	4	1	7	10	11	44
No. 2 ..	2	2	2	2	2	3	5	2	6	7	5	8	9	55
No. 3 ..	1	2	2	1	1	2	4	1	7	5	9	7	16	58
No. 4 ..	3	1	1	1	1	3	4	8	6	6	7	11	8	60
Group 3—														
No. 1 ..	1	1	1	2	2	1	3	—	7	7	2	13	14	54
No. 2 ..	0	3	2	3	—	2	4	3	6	4	4	4	2	37
No. 3 ..	0	1	1	1	2	4	5	4	10	8	3	9	12	60
Controls														
Untreated	1	8	1	2	4	6	10	11	4	3	4	2	11	67
Group 4—														
No. 1 ..	0	1	1	1	2	1	2	4	5	6	7	8	9	47
No. 2 ..	0	3	2	1	2	3	6	5	7	2	10	12	8	61
No. 3 ..	0	6	2	1	1	3	5	8	3	6	5	3	10	53
	15	38	21	17	20	35	63	72	87	67	86	128	146	795

All specifics resisted fly attack for seven weeks.

277 equals 37 per cent. of whole number.

Sheep never infested at all.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR OCTOBER, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Thyra of Myrtleview	Ayrshire ..	31 July, 1921	1,523	3·8	64·60	
Iron Plate	Jersey ...	12 July ,,	1,072	4·8	58·40	
College Mignon ...	,, ...	7 July ,,	847	5·2	52·60	
College St. Margaret	,, ...	25 Sept. ,,	957	4·8	52·50	
Hedges Madge ...	Holstein ...	15 Aug. ,,	1,176	3·8	50·10	
Miss Security ...	Ayrshire ...	20 Aug. ,,	1,483	3·0	49·50	
Prim	Holstein ...	9 Mar. ,,	1,220	3·6	49 07	
Bellona	Ayrshire ...	26 June ,,	1,072	4·0	48·60	
Gatton Glitter ...	Guernsey ...	9 Sept. ,,	949	4 3	45·30	
College Cold Iron	Jersey ...	10 Mar. ,,	720	4·8	39·80	
Miss Betty ...	,, ...	7 July ,,	763	4·0	34·40	
Yarraview Village Belle	Guernsey ...	6 Aug. ,,	454	5·8	31·06	
Netherton Belle ...	Ayrshire ...	30 Nov., 1920	575	4·6	31·03	
Glow IV.	Guernsey ...	28 Aug., 1921	726	4·3	30·80	
Hedges Nattie ..	Holstein ...	26 Feb. ,,	583	4·4	29 60	
Dawn of Warragaburra	Jersey ..	15 Oct., 1920	450	5·3	28·30	
Miss Fearless ...	Ayrshire ...	26 May, 1921	606	4·0	27·01	
Songstress	,, ...	4 Mar. ,,	422	5·2	26·40	
Maggie's Leda ...	Jersey ...	6 Oct., 1920	448	5·0	26·20	
Charming Damsel	Ayrshire ...	12 May, 1921	615	3·6	25·70	
Thornton Fairetta	Jersey ...	15 Mar. ,,	377	5·4	24·40	
Snowflake	Shorthorn...	21 Dec., 1920	419	5·0	24·40	
Royal Mistress ...	Ayrshire ...	19 Mar., 1921	570	3·8	24·06	
Rosine	,, ...	19 Jan. ,,	584	3·6	23·40	
College Evening Glow	Jersey ...	10 Oct. ,,	440	4·6	23·40	
College Grandeur	,, ...	29 Dec., 1920	425	5·0	23·30	
Confidante ...	Ayrshire ...	12 May, 1921	484	4·1	22·10	
Waterlie Blossom ...	Guernsey ...	21 May ,,	392	5·0	22 10	
Confidence... ...	Ayrshire ...	8 Feb. ,,	462	4·1	21·90	
Comedienne ...	Jersey ...	26 Nov., 1920	436	4.2	21 20	
Gatton Empire Lass	Guernsey ...	3 May, 1921	276	6·2	20·70	
Hedges Dutchmaid	Holstein ...	26 May ,,	557	3·2	20·40	

The Horse.

CERTIFICATES OF SOUNDNESS.

October list of Stallions registered and certified as sound.

Name of Stallion.	Owner.	Address.
	PONIES.	
Son Harold (L) ..	N. Lochran	Mary street, Gympie
Clyorie (L)	J. W. Ross	Goomboorian, *viâ* Gympie
Bonnie Mischief ..	D. Johnson	South Side, Gympie

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, OCTOBER, 1921.

Generally speaking, the laying for the month was excellent. The following scores of individual hens are worthy of note:—H. C. Towers's "F" White Leghorn has laid a sequence of 65, unfinished; T. Fanning's "C" of 55, unfinished; W. Fraser's "A" 42, unfinished; T. Eyre's "A" of 36, unfinished; E. Morris's "A" Black Orpington completed a sequence of 51 on the 22nd of the month. The highest score for six hens among the Black Orpingtons was made by Mr. R. Burns's pen, with 165 eggs; in the light section Mr. Fanning's pen of White Leghorns laid 162 eggs. The weather during the month has been dry and warm, at times very sultry. One death occurred, viz., Haden Poultry Farm's "A" bird (White Leghorn), through blindness.

The following are the individual records:—

Competitors.	Breed.	Oct.	Total.
	LIGHT BREEDS.		
*J. M. Manson	White Leghorns	153	903
R. Gill	Do.	138	903
*W. and G. W. Hindes	Do.	152	900
*Geo. Trapp	Do.	141	855
*Mrs. R. Hodge	Do.	150	851
F. Birchall	Do.	122	837
H. C. Thomas	Do.	116	832
*H. Fraser	Do.	148	830
*H. C. Towers	Do.	141	826
*C. M. Pickering	Do.	139	813
Oakleigh Poultry Farm	Do.	105	812
*T. Fanning	Do.	162	803
R. C. Cole	Do.	121	792
W. A. Wilson	Do.	131	785
*W. Becker	Do.	132	777
*J. W. Newton	Do.	116	763
*C. Goos	Do.	136	757
H. Stacey	Do.	139	757
Mrs. E. White	Do.	132	750
Bathurst Poultry Farm	Do.	138	749
*Thos. Eyre	Do.	155	742
W. Barron	Do.	143	741
*R. C. J. Turner	Do.	139	740
M. F. Newberry	Do.	133	736
*Thos. Taylor	Do.	141	734
*E. Chester	Do.	120	729
*S. L. Grenier	Do.	141	726
*B. Chester	Do.	141	722
*E. A. Smith	Do.	148	713
*G. Williams	Do.	132	712
J. W. Short	Do.	120	706
*Mrs. L. Anderson	Do.	134	704
O. C. Goos	Do.	118	698
Mrs. E. Z. Cutcliffe	Do.	109	691
E. Stephenson	Do.	116	690
*Haden Poultry Farm	Do.	123	675
*W. and G. W. Hindes	Brown Leghorns	112	662
*H. P. Clarke	White Leghorns	136	652
Linquenda Poultry Farm	Do.	96	651
W. M. Glover	Do.	119	627
Brampton Poultry Farm	Do.	125	599

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Oct.	Total.
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	149	961
*R. Burns	Do.	165	894
Rev. A. McAllister	Do.	142	882
*J. Ferguson	Chinese Langshans ...	131	875
*T. Hindley	Black Orpingtons ...	135	871
*A. E. Walters	Do.	148	863
W. Becker	Langshans	153	861
*Parisian Poultry Farm	Black Orpingtons ...	143	845
Jas. Potter	Do.	90	828
G. Muir	Do.	131	828
Jas. Ryan	Rhode Island Reds ...	131	820
*C. C. Dennis	Black Orpingtons ...	136	820
Jas. Evers	Langshans	118	817
*E. F. Dennis	Black Orpingtons ...	136	789
*E. Morris	Do.	141	779
*J. Cornwell	Do.	130	774
*E. Stephenson	Do.	111	733
*R. Holmes	Do.	111	725
*N. A. Singer	Do.	152	724
C. Cumming	Do.	112	691
*Mrs. G. Kettle	Do.	144	688
*J. E. Smith	Do.	137	686
*H. M. Chaille	Do.	115	684
*A. Shanks	Do.	130	680
J. W. Newton	Do.	126	678
*E. Oakes	Do.	140	637
F. Harrington	Rhode Island Reds ...	134	609
T. C. Hart	Black Orpingtons ...	137	532
Total	...	9,141	52,519

* Indicates that the pen is being single tested.

RESULTS OF SINGLE TEST PENS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	140	154	164	141	167	137	903
W. and G. W. Hindes (W.L.) ..	160	139	149	163	160	129	900
Geo. Trapp	144	135	144	139	152	141	855
Mrs. R. Hodge	140	150	156	144	151	110	851
H. Fraser	161	119	145	133	141	131	830
H. C. Towers	143	124	141	110	137	171	828
C. M. Pickering	151	139	131	116	154	122	813
T. Fanning	148	127	143	124	127	134	803
W. Becker	155	147	118	120	147	90	777
J. W. Newton	135	150	150	128	85	115	763
C. Goos	131	148	99	95	112	172	757
Thos. Eyre	129	125	85	135	138	130	742
R. C. J. Turner	129	117	117	110	132	135	740
Thos. Taylor	121	135	119	98	109	152	734
E. Chester	131	132	113	118	117	118	729
S. L. Grenier	126	145	96	124	121	114	726
B. Chester	112	119	139	112	136	104	722
E. A. Smith	151	121	123	117	112	89	713
G. Williams	166	129	93	103	111	110	712
Mrs L. Anderson	120	131	116	108	127	102	704
Haden Poultry Farm	72	106	123	123	120	131	675
W. and G. W. Hindes (B.L.) ..	97	103	94	114	110	144	662
H. P. Clarke	149	92	110	84	114	103	652

RESULTS OF SINGLE TEST PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	96	140	182	131	169	176	894
J. Ferguson	139	134	135	162	151	154	875
T. Hindley	162	149	155	112	150	143	871
A. E. Walters	156	150	135	188	137	147	863
Parisian Poultry Farm	135	141	143	179	102	145	845
C. C. Dennis	143	127	120	150	141	139	820
E. F. Dennis	113	141	132	129	130	144	789
E. Morris	145	137	87	150	130	130	779
J. Cornwell	126	113	131	151	122	131	774
E. Stephenson	139	117	124	120	100	133	733
R. Holmes	99	119	124	131	151	101	725
N. A. Singer	122	108	116	120	111	147	724
Mrs. G. Kettle	110	130	145	75	103	125	688
J E Smith	149	158	116	94	88	81	686
H. M Chaille	82	127	121	144	121	89	684
A. Shanks	88	114	111	123	115	129	680
E. Oakes	82	121	107	138	98	91	637

CUTHBERT POTTS,
Principal.

THE 1921 SUGAR CROP.

In June last the estimate of cut cane for the 1921 season in districts below Townsville was 2,161,000 tons. The General Superintendent of the Bureau of Sugar Experiment Stations, with his present estimate of 2,298,384, now proves the conservancy of his pre-harvest forecast. Favourable weather in the Lower Burdekin, Mackay, Bundaberg, and Wide Bay sugar areas was the main factor in this remarkable improvement in sugar prospects. North of Townsville excessive rain reduced the tonnage taken off, but, in spite of this handicap, this reduction was small when compared with the increase in the more southern canefields. In the Lower Burdekin, only 15 in. of rain were registered up to the 30th May, and the outlook then was not encouraging. Later in the growing season weather conditions improved, with the result that the extra weight of cane to be crushed in that locality alone amounts to 48,000 tons. It is now estimated that Queensland should manufacture something like 278,000 tons of sugar. If fewer tons of cane are needed to make a ton of sugar than last year, the output may be even higher. Last year's estimate for sugar consumption was about 285,000 tons, and it is stated that, for some unknown reason, this year's consumption will not be so great. Adding the New South Wales estimated production, 17,000 tons, it will be seen that the Commonwealth will have an abundance for this year, and perhaps a carryover to next season. The present estimate over the June figures is about 28,000 tons of manufactured sugar.

SOUTH COAST CANEFIELDS.

Reporting upon the Logan and Albert cane districts, the General Superintendent of Sugar Experiment Stations said that all the mills in that locality had now finished operations for the year. The crushing has been a small one, but, owing to the decline in the price of arrowroot, canegrowing has come more into favour again. In an inspection of the district, a number of new areas had been noticed under cane. The re-erection of practically the whole of the Nerang mill at Pimpama Island, by Mr. William Heck, had provided a fine crushing plant at that place, capable of dealing with from 30,000 to 40,000 tons of cane. This mill had worked very smoothly this year, and Mr. Heck deserves much credit for his enterprise in assembling so fine a plant. He expects a much larger crushing next season. The principal varieties grown about the Logan and Albert are Green Seedling, D.1135, and New Guinea 64 or "Purple Top." There is, however, far too much of the latter cane about the district, as it contains too much glucose to be a useful sugar producer. The district is now looking well, though further rain would be welcome.

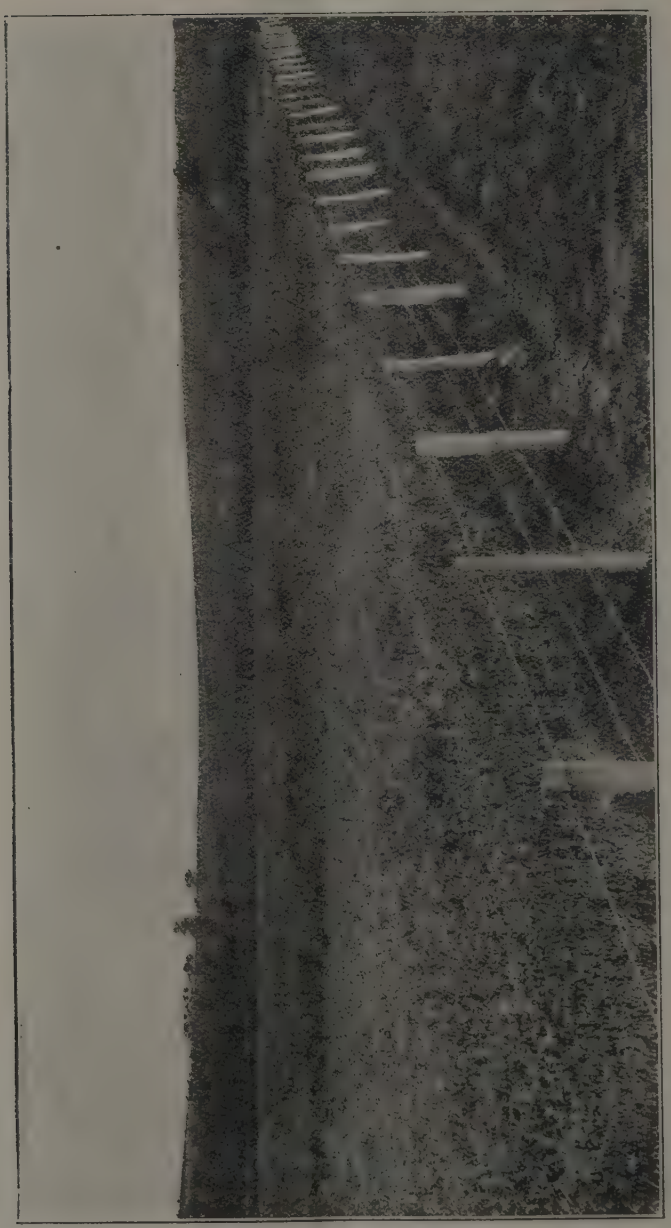


PLATE 78.—CROP OF SKINLESS BARLEY, KILLARNEY DISTRICT.

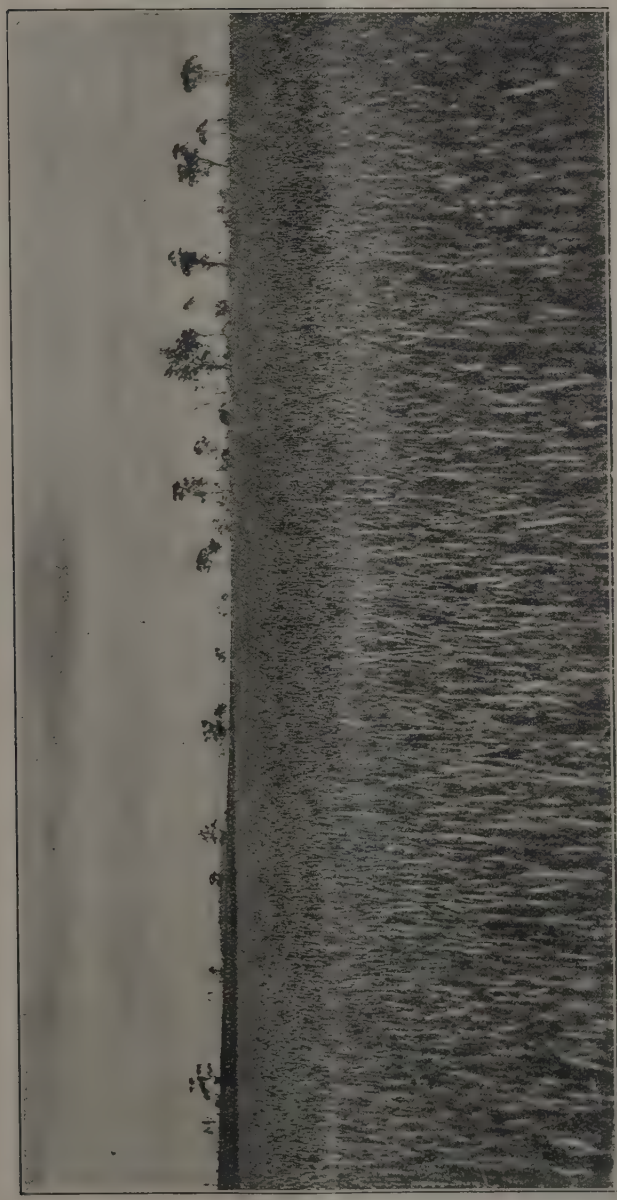


Plate 79.—A Wheat Crop, Clifton District.

The Orchard.

THE FRUITGROWING INDUSTRY—II.

By ALBERT H. BENSON, M.R.A.C.

In the first of this series of articles which appeared in the November number of this Journal, I pointed out that the most difficult problem by which our fruitgrowers are confronted to-day is not so much how to grow fruit as how to dispose of it when grown. This matter was discussed, and an attempt was made to show that disposal is largely a matter of distribution, and that the first step to be taken to place our fruitgrowing industry on a sound basis is to bring about a better method for distributing our fruits within the Commonwealth. Suggestions were offered respecting the best methods to be adopted in order to obtain this result, and thus bring about an increased consumption of our fruit.

In the present instalment, the question of opening oversea markets for fresh fruit is considered, as a further aid towards the disposal of our surplus. This is a new departure for this State, as hitherto our exports of fresh fruit outside the Commonwealth have been confined to sending a few pineapples from time to time to New Zealand, and to an attempt made some years ago to open up a market for pineapples and citrus fruits in Canada. Much, therefore, will necessarily have to be done before we can hope to build up a profitable export trade; still, as we must find a market for our fruit if our industry is to be kept going, we cannot afford to loose any more time, but must do our utmost to solve the difficult question of determining the best methods to be adopted in placing our fruits on oversea markets in such a condition that they will not only meet with a ready sale, but will realise a price that will leave a fair margin of profit to our producers.

It is possible that there will be many failures before success is finally achieved, as I firmly believe it will be, as there is always a great deal to learn in starting a new undertaking such as sending highly-perishable fruits to distant markets; and it is only by the exercise of the greatest care in the handling and packing the fruit and by carefully conducted experiments to determine the conditions best suited to their keeping and transport that it can be accomplished. Growers must not be disheartened if success is not immediately achieved, but must remember that the apple-growers of Tasmania had many serious losses before the best means of transporting their fruit was determined, and as our coastal fruits are of a more tender nature than apples, and will require a totally different treatment, it is only to be expected that we will have many initial difficulties to overcome before we are finally successful.

The first point to be considered is: What fruits can we grow that are suitable for export? By "suitable for export" I mean fruits that, provided they can be sent successfully to distant markets, will meet with a ready sale at a satisfactory price on those markets.

The only fruits that we can grow in Queensland that, in my opinion, will meet those requirements are citrus fruits, such as superior oranges and very carefully selected mandarins—midseason and possibly late apples from the Granite Belt, and, probably, pineapples. Other fruits might be tried, but I am very doubtful of their being a success.

With respect to citrus fruits, we have the advantage of the difference in the seasons in the northern and southern hemispheres, as our main crop is in season when the main crop in Europe and America is out of season; consequently, our fruit should reach the markets on the other side of the line when they are comparatively late. The marketing of the main crop of citrus fruits grown in the northern hemisphere is nearly over by the month of May, though late ripening varieties are available, to a certain extent, right through the season up to the time that the early main crop fruit is again on the market. Our main crop oranges and mandarins ripen during the months of April, May, and June, and should, therefore, meet with a fair demand, as we could supply the home markets from the end of May to about the middle of August with high-class fruit.

That a market exists I feel certain, but the question arises: How are we going to get our fruit there? The answer is: By the exercise of the greatest possible care at this end, to begin with, to provide the right condition on shipboard and see that these conditions are maintained throughout the voyage.

The handling of the fruit at this end is, I am afraid, going to be our greatest difficulty, as our growers do not yet realise the importance of packing nothing but absolutely perfect fruit in perfect condition, and the rigorous culling of any fruit that shows the slightest defect or has received anything except the very greatest and most careful handling. Absolutely sound and perfect citrus fruit will not decay, but will keep for a considerable period, whereas a bruised fruit is a spoilt fruit that will spoil other sound fruit with which it is packed.

The rotting or, as it is termed in the trade, "specking," of citrus fruits is due almost entirely to green mould fungus, which can only gain an entrance into the fruit when the skin is injured. Fruit with a perfectly sound skin will not speck. The injury may be so slight as not to be noticeable, but yet large enough to permit of the entrance of this fungus, and may be caused by sucking insects such as scale, or sucking bugs, by the puncture of fruit flies or the larva of the spotted peach moth, by sucking moths, or a thorn prick or by rubbing or other mechanical injury, and thus it often happens that a quantity of fruit is specked whilst still hanging on the tree. Bruising caused by the gathering of the fruit frequently leads to specking, and pulling instead of clipping is accountable for heavy loss from the same trouble.

Specking can be prevented by the exercise of proper care, which means—

1. Gathering and destruction of every specked fruit in the orchard, instead of allowing it to scatter millions of spores broadcast.
2. Handling the fruit with as much care as one would handle eggs.
3. Culling every fruit that shows the slightest sign of injury.
4. Keeping the packing-shed clean and free from specked fruit.
5. Sweating the fruit for at least seven days before packing.
6. Wrapping all fruit before packing and ensuring that it is not bruised during packing or in transit.
7. Use clean cases.

All these precautions must be taken by the grower, and if he thoroughly carries them out there is no question as to the fruit carrying satisfactorily.

For many years oranges and lemons have been sent to Australia from Southern Europe as ordinary cargo, and they have landed here in perfect condition. The reason of their release on local markets in good condition is due to the fact that nothing except absolutely sound fruit is placed in the case, and that it is handled with the greatest care. This fruit stands the journey through the tropics without loss, and if we take equal precautions there is no reason why our fruit will not carry equally as well.

The Department of Agriculture of the Union of South Africa has recently devoted a considerable amount of attention to the question of the wastage of citrus fruits in transit, and has published the result of their investigation in the form of a bulletin. The results obtained show that the primary cause of wastage is "specking," due to an injury to the skin, and this is tersely summed up in the following statement:—

> "The results of the investigations show conclusively that with ordinary care and intelligent handling it is possible to place South African citrus fruits on the overseas markets showing a negligible amount of waste."

This bears out the advice that has been given by this Department for many years, and the successful export of our citrus fruits will depend very largely indeed on the manner in which the grower does his part, as the carriage of perfectly sound fruit, properly packed, presents no difficulties that cannot be easily overcome.

With respect to apples, there is no great difficulty, provided the right varieties are selected and gathered at the right stage of development, carefully graded for size and colour, and only one size of fruit of one colour is packed in a case, and that every blemished, bruised, diseased, or defective fruit is rigorously excluded.

Owing to our climatic conditions, apples suitable for export ripen somewhat earlier in this State than in any other part of the Commonwealth, and we would therefore be the first on the home market with our fruit, and for the first one or two shipments in the season we would have no Australian competitors. The oversea market demands high quality fruit; in my opinion, therefore, it will be desirable to confine our attention to three or four varieties that do well here and attempt to build up a demand for these varieties.

With regard to pineapples, this is a matter that will require some very careful preliminary experiments to be carried out on shore before an attempt is made to send a consignment overseas, as it is essential that the exact conditions under which this fruit can be kept must first be accurately determined. Over twenty-five years ago I succeeded in keeping pineapples in perfect condition in cool storage provided

with perfect ventilation, but since then a number of experiments made to cool-store this fruit have not been successful; probably owing to the fact that the temperature was much too low, and that the air in the chambers was not fresh.

When in London during the Franco-British Exhibition of 1908, I saw pineapples stored in the cellars under Covent Garden Market that had been gathered at least seven weeks, and probably eight weeks, before. They were still in perfect condition, and from this experience, as well as from the success I had in my first experiment, I am of the opinion that the difficulty of sending our pineapples home in good order will eventually be overcome.

My opinion with respect to the exportation of all Queensland-grown fruits is that the main factor that will determine the success or otherwise of the undertaking is the care that is taken by the growers to see that nothing but perfect fruit, handled like eggs, and properly graded and packed, is sent. If this is done by the growers, I have little doubt that the transport difficulties now confronting us will soon vanish, and thus another outlet for the disposal of our fresh fruits will be obtained.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING OCTOBER, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of Years' Records.	Oct., 1921.	Oct., 1920.		Oct.	No. of Years' Records.	Oct., 1921	Oct., 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	0·90	20	2·65	1·39					
Cairns	1·97	39	3·96	1·31	Nambour	3·20	25	1·82	7·29
Cardwell	2·01	49	5·31	5·75	Nanango	2·35	39	0 99	2 66
Cooktown	1·14	45	1·59	1·90	Rockhampton ...	1 86	34	3·35	4·19
Herberton	0·91	34	2·89	1·33	Woodford	2·65	34	1·20	3·12
Ingham	1 52	29	4 91	2 39					
Innisfail	2 98	40	5·59	3·16					
Mossman	3·10	13	4·10	3·19	*Darling Downs.*				
Townsville	1·19	50	5·78	1·23					
					Dalby	2·12	51	1·36	2·64
Central Coast.					Emu Vale	2·34	25	1·78	2·79
					Jimbour	1·88	33	1·02	2·62
Ayr	0·95	34	3·57	3·42	Miles	2 01	36	1·29	3·27
Bowen	1·03	50	3·41	0·92	Stanthorpe ...	2 59	48	4·16	2·07
Charters Towers ...	0 66	39	3 29	0 68	Toowoomba ...	2·68	49	1·33	3·82
Mackay	1·88	50	1·79	2 82	Warwick	2·25	34	2·57	2·52
Proserpine	1·75	18	2 88	2 46					
St. Lawrence ...	1·87	50	2·08	3·58					
					Maranoa.				
South Coast.									
					Roma	1·74	47	1·87	3·43
Biggenden	2·32	22	1·83	5·45					
Bundaberg	2·11	47	1·82	3 27	*State Farms, &c.*				
Brisbane	2 62	70	1·36	2·16					
Childers	2·52	26	1·17	9·27	Bungeworgorai ...	1·32	7	1·23	3·04
Crohamhurst ...	3 61	30	1·93	8·14	Gatton College ...	2·32	22	0·67	3 68
Esk	2·47	34	1·08	5·86	Gindie	1·44	22	0·40	5·97
Gayndah	2 44	50	0·89	5·17	Hermitage ...	1·96	15	2 50	2·95
Gympie	2·77	51	2·61	4·81	Kairi	1·06	7	2 66	1·27
Glasshouse M'tains	2 95	13	1·65	6·08	Sugar Experiment Station, Mackay	1·71	24	1·60	2·15
Kilkivan	2 69	42	1·97	3·77	Warren	2·81	7	1·10	5·46
Maryborough ...	2 77	50	0·73	4·25					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for October this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

Horticulture.

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

LAGUNARIA PATERSONII.

Natural Order Malvaceæ (Mallow and Hibiscus Family).

By E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—*Lagunaria*, a name given on account of its similarity to *Lagunæa*, a genus now included under Hibiscus, so called in honour of Andres de Laguna, a Spanish botanist, 1499-1560. *Lagunaria Patersonii* is described in the "Botanical Magazine" T. 764 (1804), under the name of *Lagunæa Patersonii*. The specific name is in honour of Colonel Paterson, a former Lieutenant-Governor of New South Wales, who collected seed at Norfolk Island and took it to England in 1792 (according to Endlicher, Prod. Norf., p. 75), where it first flowered in 1801.

Description.—(Bentham's "Flora. Austr.," I., 218) "A tree, the young parts and inflorescence more or less covered with minute scurfy scales, but otherwise glabrous. Leaves petiolate, oblong or broadly lanceolate, rarely ovate oblong, 3 to 4 in. long, entire, somewhat coriaceous, white underneath when young, glabrous and pale green on both sides when full grown, the scales of the under-surface almost disappearing. Pedicels very short and angular, bracteoles three to five, very obtuse, united in a broad, shortly-lobed cup, usually persistent at the time of flowering, but sometimes these fall off early. Calyx four to five lines long. Petals narrow, above 1½ in. long, slightly tomentose outside."

Flowers.—These are large, about 2 in. across, of a delicate lavender-pink, fading to almost white; the tree is very floriferous, producing numerous flowers for several weeks; they are borne at the axils of the leaves, and quite a long succession of bloom is provided; the flowers are very attractive to bees, and when in flower a large tree will provide at early morning a humming noise similar to the swarming of bees.

Seeds.—The seeds are borne in a capsule similar to that of the rosella; attached to the inner portion of them are numerous short barbed hairs, that will attach themselves to the skin, and are very irritating, being not unlike those of the velvet bean (*Mucuna pruriens*), commonly called "Cowitch." The seeds are also similar to those of rosella.

Timber.—"Wood firm, close in grain and nearly white, easy to work, would be useful." (Bailey's "Queensland Woods," No. 20.)

Bark.—Like a number of the plants of this Order, a very fine fibre can be obtained by maceration.

Habitat.—Queensland, in the neighbourhood of Bowen, and at Norfolk Island. Bentham, in "Flora Austr.," remarks on several small differences between the Norfolk Island form and the Queensland one. Backhouse, in his "Narrative of the Australian Colonies," 258 (1835), writing of Norfolk Island, says: "Scattered on the grassy hills is hibiscus, or *Lagunæa Patersoni*, which forms a spreading tree of 40 ft. in height. It is called "White Oak," its leaves are of a whitish green, and its flowers pink, fading to white, the size of a wineglass; it is, perhaps, the largest plant known to exist, belonging to the Mallow tribe. In a thick wood, I met with it 80 ft. high, and with a trunk 16½ ft. round."

In the Brisbane Botanic Gardens there is a fine specimen between the centre island pond and the river; it is from 45 to 50 ft. high, with a spread of about 40 ft. It flowers during October and November, and although not such a striking feature as some more vivid flowering trees, is decidedly a very beautiful sight when in flower, with its dense masses of lovely soft lavender-pink blooms, that are, however, much smaller in size than that given of the Norfolk Island form.

Propagation.—From seed or by cuttings, the tree is very suitable for street or general planting, being of compact growth, attractive appearance, and particularly free from insect pests. Mr. J. H. Maiden, in the "Forest Flora of New South Wales," Vol. I., 113, strongly advocates its planting for these purposes, saying: "The tree is very shapely, and ornamental in appearance, and is worthy of being planted

far more extensively than it is.'' When in Adelaide in December, 1919, Mr. J. F. Bailey drew my attention to a number of very fine specimens that are planted along North Terrace alternate with *Sterculia diversifolia* (Kurrajong), two Queensland trees that I am afraid have been rather neglected in their homeland.

GARDEN NOTES.

FLOWER GARDEN.—Although not a busy time for seed sowing, a few things can still be planted, such as balsams, cosmos, marigold, zinnias, celosia, and portulacca. This latter can be obtained in many rich colours, and pleasing effects may be made by grouping them in separate colours. To do this it is necessary to transplant soon after the plants commence to flower; they can be used with good results grown on newly planted rose beds in exposed situations, as the succulent green plants afford considerable shade to the surface and protect the ground from hot summer sun, without unduly robbing the roses.

Take advantage of a showery day to plant out flowering annuals available. If necessary, the plants can be sheltered by a small piece of leafy bush. Chrysanthemum planting should be finished; have stakes ready for staking when necessary. Liquid manure, occasionally applied, will put good growth into chrysanthemums, and amply repay the trouble with better flowers. Keep asters and dahlias moving, and give plenty of water in the evening. Remember, a good soaking every other day is far preferable to a light sprinkle daily. Dahlias must have a well-drained situation, and if planted in exposed situations, mulch the surface around the plants to keep the bulbs cool. Coleus and croton cuttings may be put in. Both these plants are worthy of more consideration than they seem to get; the former revel in a sheltered situation, while the latter like plenty of sun, but protection from strong winds. A suitable place should be: Morning sun up to about 2 p.m.

Lift gladioli bulbs as they ripen after flowering, and store in a dry place. Interesting work can be accomplished by the raising of seedling gladiolis, and many good kinds can be looked for if the seed is from a decent strain. In our climate the seedlings come to maturity and flower much sooner than in colder localities. Hippeastrums also provide a good field for experiment, and many beautiful kinds may be raised from selected seed.

In the bushhouse, caladiums should now be making good growth. Keep well supplied with water, give liquid manure about once a week, and cut off all flower stems as they form, unless they are wanted for seed. The growing of caladiums from seed is fascinating work, and fine results are obtained by cross-fertilisation. In selecting for this purpose, have one variety of good strong growth, without reference to any great beauty, and then cross with pollen from one of the delicate rich-coloured leaf kinds; cross both ways. Better results will follow from this system than by having two rich, delicate kinds. When potting caladiums use a rich, good leaf or turf compost, plenty of fibre through it; also small charcoal. Do not use a dense, close-setting soil; have it free and porous.

TOMATO SOUP.

An excellent product of the Returned Soldiers and Sailors' Co-operative Cannery at Stanthorpe is tomato soup, samples of which have been received at this office.

This high-quality product, well canned and attractively labelled, is rapidly establishing itself on the market as a culinary necessity, and is being favoured with a strong home demand.

WEED IDENTIFIED.

The Government Botanist, Mr. C. T. White, F.L.S., advises as follows on a weed send by Stock Inspector F. H. Singh for identification:—

''The plant sent by Inspector Singh is the fumitory (*Fumaria parviflora*), a weed fairly common in the cooler parts of the State. It is a native of Europe, and is not known to possess any harmful properties. In England it was at one time largely used as a herbal medicine for various complaints.''

Tropical Industries.

SUGAR: FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations, who has been officially visiting the Sugar Experiment Stations at South Johnstone, Mackay, and Bundaberg in connection with the work of those institutions, the initiation of new experiments, and the collection of data, has returned to Brisbane. In addition to the abovementioned the sugar districts of the Herbert, Johnstone, Babinda, Cairns, and Mossman were also visited, as well as the entomological laboratory at Meringa.

At the Herbert River, although the cane was not cutting out quite so well as anticipated some months ago, it was of good quality, and sugar was being rapidly produced in large quantities for shipment south. Considerably over 1,000 tons per week were being conveyed by tram to the Lucinda Jetty, the large sugar-stores were filled, and steamers were being loaded, the whole scene presenting one of the greatest activity. The cane was being sent in remarkably clean to the Victoria and Macknade mills. No bad topping, adhering trash, or dirt was apparent. Owing to the large amount of rain experienced, the plantings of cane for next season were late, but a large area was being put under.

Disease, in the shape of what is known as "gumming," was seen in many places, notably in connection with the variety known as Clark's Seedling. Grubs were also doing damage in places. Recently the Sugar Experiment Stations shipped Tableland Badila to the farmers' associations at Macknade and Halifax, and this had germinated excellently and was vigorous and healthy. A variety known as H. 409, distributed by the Colonial Sugar Company, has also been planted out to some extent this year.

An excellent caneplanter, invented by Mr. W. J. Enticknap, of Macknade, was inspected and found to be doing fine work. It makes the drill, plants the cane, covers it, and applies fertilisers in the one operation.

The germination of some of the young cane at Macknade this year has been somewhat irregular, but as the cane is still coming through, this may yet make a good strike. The farmers generally are alive to the importance of liming and fertilising, and large quantities of these materials have been purchased this season.

At Mossman the mill has completed this year's crushing, the tonnage of cane operated on amounting to 61,500 tons. They have had a very satisfactory run and experienced good weather during the harvesting. The young cane for next season, of which there is a very large area, looks exceedingly well, and there is every promise at the present time of a good season for 1922. The directors of the mill are turning their attention to supplies of lime, and they already buy and supply quantities of fertilisers to their farmers.

In the Gordonvale district, near Cairns, the young plant cane appeared excellent in growth, the cultivation had been exceptionally good, and all fields presented a clean, attractive appearance. There has been a large area planted for next year. The crops now being treated at Mulgrave and Hambledon were lighter than estimated in the earlier parts of the year, owing to damage by grubs. Some delay was caused at Mulgrave by a cutters' strike; this, however, had ended after about three weeks' lost time at the best part of the season. Preparations for the enlargement of the crushing capacity of Mulgrave next year were going on apace. Matters generally were going smoothly at the Hambledon Mill, and here, also, the young plant cane for next season looked well cultivated and clean, while the area was large. The entomological laboratory at Meringa was inspected, and the buildings and surroundings were in good order. The work is now under the charge of Mr. Edmund Jarvis, who is exceedingly busy in laying out his campaign for the ensuing grub season and also in fighting the weevil, borer of sugar-cane, and other insect pests.

The estimate of the crop at Babinda had also been reduced, owing to excessive rains. From the beginning of January up to the 14th October 230 in. of rain had fallen. This had exercised a most prejudicial effect on the late cut ratoons of last season. The heavy rainfall also caused a good deal of the other cane to fall and die. Up to the time of the General Superintendent's visit towards the end of October, 86,000 tons had been crushed, and it was considered that another 44,000 tons remained

to be put through. The mill authorities expect to finish before Christmas, and this will give the ratoons a far better chance of coming on for next year. The sugar output is expected to be about 13,000 tons. The fibre content at Babinda in the Badila cane is very high, ranging up to 15 per cent. On the whole, the mill has worked very smoothly this year and has done slightly better than last year. Owing also to the heavy rains the plantings for next season have not been so good as last year.

The work of the Sugar Experiment Station at South Johnstone during the past year has been highly successful. The whole of the experiment work in the field has shown a large profit. First ratoon crops are averaging 43 tons per acre, and, but for the excessive rain causing much of the cane to fall and die, the yield would have been much heavier. Seedling work has also been undertaken, and a large number of new seedlings have been propagated and are now being selected and potted out.

A very heavy distribution of varieties to farmers in the Northern districts was made this year, no less than 22 tons being given out in small packages to growers. A heavy crop has been harvested and sent to the mill, both from experiment plots and land reserved for revenue purposes. The chemist in charge of this station, Mr. P. H. McWalters, had had a strenuous time during the year, and has carried out his duties with considerable zeal, energy, and ability.

The rainfall on the Johnstone River has not been so great as at Babinda, but it has been an excessive rainfall, nevertheless, amounting to 180 in. This has made the plantings for next season very late. Two strikes have occurred in this district—viz., at South Johnstone and Goondi, which have further delayed matters generally. However, both have been settled, and work is now being rapidly pushed on. The young cane is looking well and growing rapidly. The whole district is in a most flourishing state at the present moment, and large sums of money will be circulated this year.

At Mackay the district generally was looking splendid, and the cane has improved considerably since July, so that the mills have increased their estimates from 50,000 tons of sugar to 57,000 tons. Large areas of cane have been planted for next season, and the prosperity of the district is most marked.

The work at the Sugar Experiment Station at Mackay has been also most successful, and heavy crops are being cut. The distribution work has also attracted considerable attention. The variety known as Q. 813 sent out from the station a few years ago is coming into great prominence, and large areas are being planted. Mr. T. A. Powell, a grower on the North Side, cut 300 tons of this cane during the present season, averaging 40 tons per acre, with a commercial sugar content of 15.7 per cent. average. At the Palms Mill this variety has given from 16 to 16.3 c.c.s., and the manager intends planting out considerable quantities this year. The chemist in charge of the Mackay Station, Mr. F. Keogh, has (in addition to his usual duties, which he has carried out satisfactorily) made over 300 tests of cane juices for farmers, as well as analyses of soils and fertilisers.

The opening of the train service to Mackay is attracting considerable notice to the Mackay district, and will undoubtedly prove the greatest blessing to the town and country. Many landseekers held off Mackay in the past owing to its difficult port, but now it is in railway communication with the southern capitals, this fine cane district will come into its own. The change from the discomfort so often experienced at Flat Top Anchorage to the certainty of train travelling is greatly appreciated by all whose business takes them to Mackay.

At Bundaberg the cane had also improved during recent months, and the mills were dealing with larger crops than originally anticipated. Rain, however, is now urgently required for the young cane, of which a great deal has been planted for next year. The sugar experiment station has nearly completed its cutting for this year, a fine average crop having been harvested. The chemist in charge, Mr. J. Pringle, has carried out his work with care and energy, and the chemical work this year has been heavy.

Summing up, Mr. Easterby remarked that what may be termed the Southern districts, below Townsville, were generally cutting out heavier crops than originally estimated, while the districts above Townsville, owing to exceptional wet, were somewhat under the estimate, although the crops were good.

The prosperity of the sugar industry this year was something Australia had to be grateful for, seeing that the wool, mining, and meat industries were all depressed. The sugar industry was circulating immense sums of money, not only around the sugar-mills, but in many parts of Queensland and Australia, its indirect benefits being felt in other States as well as our own. It is, therefore, sincerely hoped that this great Australian industry will continue to flourish by the guarantee of its stability.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (4th November, 1921) from the Northern Field Assistant, Mr. E. H. Osborn:—

"*Babinda.*—In last month's report I mentioned that, owing to such a heavy wet year, the tonnage to be put through by the Babinda Central Mill would be under earlier estimates.

"In connection with this, the following rainfall figures are decidedly interesting:—

The total fall from 1st January to 30th September	227.61 in.
Average fall for six years for the same period ..	119.38 in.
Fall for month of September, 1921	11.07 in.
Average fall for six years for September	6.88 in.

"These figures give an idea of the great quantity of rain that has fallen, and also the difficulty that the management has had to contend with, in order to keep up an adequate supply of cane for constant crushing purposes.

"Early in the month (October) a spell of fine weather set in, making harvesting conditions more normal, and giving the cane a chance of improving in quality. With the advent of these favourable conditions, ploughing, planting, and weeding operations were soon in full swing, hands doing their utmost to benefit by this very needed change.

"In the northern end of the Babinda area the recently cut cane was ratooning well, and some very good young plant cane was also seen. Although this end has often been damaged badly by grubs in the past, the injury caused by them this year was not great.

"Probably the amount of rain that fell so continually minimised their damaging efforts. A good number of borers was noticed in this area.

"D. 1135 has recently been planted in much larger quantities, growers claiming that it is a good striker, and certainly stands up to the grubs better than any other variety.

"The area formerly known as the "Bartle Frere Estate" looks extremely well. A lot of very fine Badila is still waiting to be cut, both on the light red volcanic soils and also upon the rich deep alluvial flats. The ratoons are coming away very well, whilst some very nice plant cane was also seen.

"Around Babinda proper a lot of new houses have been built lately, and many more also are in course of erection. The demand for new houses is very keen, any vacant one being eagerly snapped up. The State hotel has also added to its already fine accommodation, to satisfy the needs of the great number of the travellers continually passing through this important township, and the general expressions of satisfaction say much for the popularity of this public utility.

"*Freshwater.*—This district is now making very rapid progress, as the lately completed tramway bridge over the river at Stratford brings a further area of land more into direct touch with the district. The bridge spans over 600 ft., and as the entire cost so far has been borne by the owners of three farms, they are to be complimented upon their progressive policy.

"There will not be a great deal of cane brought across the bridge this year, but as there will be somewhere in the vicinity of 260 acres of land under cane in this particular locality for next year, it will be readily seen how important an undertaking it is. Most of the soil is first-class deep rich alluvial, and the young plant cane looks splendid, it having struck well and has been kept free very nicely from weeds. A shower of rain about the middle of the month also helped it along. Although, as before-mentioned, only three farms are located just here, they are well up to date, and employ tractor-power. As the soil here is very free and loose, it will be seen how popular the use of tractors is becoming, for they are being used for ploughing, cross ploughing, drilling, and planting in this class of country with every success.

"Farther up Freshwater Creek a further large area of new land is being opened up, and some magnificent young plant cane was noticed upon Mr. D. O'Hara's farm. It has struck remarkably well, is perfectly clean, and looks most healthy. As most of the areas about here were citrus orchards last year, and are now growing cane, it will be seen that no time has been lost by the growers to obtain such good results. In

the near future some very big crops of cane will be harvested from the Freshwater areas.

"*Hambledon.*—Crushing is proceeding satisfactorily, no strikes or labour troubles having so far caused any delay, and the mill expects to finish shortly prior to Christmas time. At time of my visit some very hot weather was being experienced, making harvesting conditions anything but pleasant. Quite a number of tractors are being used in this area, and their usefulness was much appreciated in the course of the hot spell.

"Although the grubs did a lot of damage to this and adjacent areas this season, it is remarkable how very well the cane is ratooning.

"The large area of young plant cane also looks well. A good deal of D. 1135 is being planted again this year, and a large number of the growers have obtained supplies of new varieties of cane from the experimental station at South Johnstone, with a view to trying same under local conditions. Unfortunately, several farmers were unable to get any plants, not having applied in time.

"Probably more manure is being used in the district this year than ever previously, and basic super meatworks, dried blood, and ammonia and others have been ordered in large quantities.

"*Gordonvale.*—There is still some very fine cane to be harvested. A patch of Badila (plant) on Mr. Sue's farm will probably cut between 50 and 60 tons to the acre. This block has been under cane for a very long time, but has been treated with filter press, had green corn ploughed in, and also had the advantage of about 10 cwt. meatworks manure to the acre. Mr. T. Shepherd, on Highleigh, claims that he has obtained some very good results from Malagache on his farm. The soil is light and porous, and was originally all forest. Mr. Shepherd's figures are—

Plant	25.0 tons per acre.
1st Ratoons	26.0 tons per acre.
2nd Ratoons	24.0 tons per acre.
3rd Ratoons	16.0 tons per acre.

"The ratoons now coming on look very healthy. Density figures for the cane were very fair.

"*Aloomba.*—Wet weather had again set in, interfering with harvesting of the present crop, and also with the cultivation of next year's cane. A good deal of young cane has been planted, a big proportion of it being D. 1135, and in most cases the strikes have been fairly good. Quite a number of farmers have also planted out new varieties obtained from the South Johnstone Experiment Station. Among these were noticed Q. 813, E.K. 1, E.K. 28, 7 R. 428, Q. 903, Tableland Badila, Hybrid No. 1, and Badila Seedling. The results of their growth will be watched with interest.

"Taking this year throughout, the weather experienced in North Queensland has been anything but favourable to canegrowing. At time of writing, rain is still threatening, making conditions very uncomfortable for the man on the land, and an early return to normal November weather is very much desired."

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (4th November, 1921) from the Southern Field Assistant, Mr. J. C. Murray:—

"In the course of the month of October as much of the Mackay district as time and weather conditions permitted was visited.

"The sugar industry in this important centre is progressing more satisfactorily than has been the case for some years. The present harvest is a good one, and the c.c.s. values in the different varieties of cane are gratifying. The various mills have reached a high standard of efficiency, and the supervising chemists are to be congratulated on the percentage of extraction. Labour, taken on the whole, is efficient at Mackay this year, and no serious industrial trouble has occurred.

"The growers this year are realising more than ever the necessity for more scientific farming, and matters to which the average grower has not hitherto given much thought are being discussed and studied. Most important in this respect is the endeavour being made on the part of planters to obtain adequate supplies of lime. The obtaining of burnt lime prior to the rail coming through from the south

was almost an impossibility, but this now will be more readily obtained, and will add to the many advantages already conferred on the district by the railway. There is at present a good deal of discussion among the farmers as to which is the better to use, burnt lime or pulverised limestone.

"The former is of the more agricultural value, for the following reasons:—No amount of mechanical pulverising can reduce limestone to an equal fineness to that obtained in burnt lime that has been airslaked. On slaking, burnt lime falls into a very fine powder. When it becomes converted into a carbonate it still retains its powdery condition, and can be spread over a large surface and mixed freely with the soil. By burning, lime is brought into a caustic state. In this condition its action upon the soil and upon organic matter is more vigorous than pulverised limestone; in fact, it will bring about results in some soils that the latter would not produce at all.

"Dealing with cane varieties in the Mackay district, there are a number of canes paying the farmers well. The best of these include Q. 813, 1900 Seedling, Clark's Seedling, H.Q. 285, and D. 1135. There are a number of other promising varieties, however, that have been distributed of recent years from the Mackay Experiment Station, and these include B. 3747, Q. 1092, Q. 695, Q. 1098, Q. 135, Q. 1133, B. 3922, Q. 1121, Q. 970, N.G. 83, N.G. 103, Q. 813, Q. 458, Q. 659, N.G. 130, Q. 855, Q. 903, and M. 189. Malagache is also a variety making a good showing in some parts of the district. Yuban is growing on many farms, but ought to be rapidly discarded for reasons well known to those who grow it.

"The ratoons on many farms are coming shyly this year, and the growers are considering the application of chemical fertilisers in the form of sulphate of ammonia or nitrate of soda. I would like to make remark on the comparative value of these fertilisers.

"Regarding cane pests in the Mackay district, these appear to be causing a minimum of loss. Cane borers are present in some fields, but are well under control. Other parasites, such as leaf hopper, wire worm, and cane grub are present, but are controlled by natural enemies. In many instances the farmers are destroying the feed trees, and thus checking, to some extent, grub infestation.

"It is noticeable in a number of instances that farmers do a great deal of cultivation in young plant cane with the plough. On one hand, from the growers' point of view, this expedites the weeding and saves labour, but on the other the process is really harmful and ought to be discontinued, if possible. The harm done by this process has often been pointed out, and better tonnages would be obtained from crops that have had more careful cultivation in their early stages."

SUGAR: THE 1921 CANE YIELD.

It is interesting to compare the yield of cane in the different districts this year. It will be noticed, from the table given below, that the principal canegrowing areas are Mackay, Innisfail, Babinda, Lower Burdekin, Bundaberg, and Childers. The sugar districts north of Townsville will produce 896,000 tons of cane, while those below will yield 1,378,500 tons:—

APPROXIMATE TONNAGES OF CANE BEING CRUSHED IN THE DIFFERENT DISTRICTS DURING THE PRESENT SEASON.

	Tons.
Mossman	62,000
Cairns	176,000
Babinda and Innisfail	440,000
Herbert River	218,000
Lower Burdekin	303,000
Proserpine	60,000
Mackay	464,000
Bundaberg and Isis	479,500
Maryborough and Mount Bauple	24,000
Moreton	36,000
Beenleigh	12,000

Botany.

A NATIVE YAM.

By C. T. WHITE, F.L.S., Government Botanist.

The Instructor in Agriculture for Central Queensland (Mr. G. B. Brooks) has recently forwarded me specimens of a scrub yam, with the following report:—"I am sending a small tuber and piece of foliage of a scrub yam procured in the Dawson Valley district. In certain scrub areas they are to be found—on breaking up the land for the first time—in very large quantities. In size they are similar to the sweet potato. Pigs are said to be fond of the tubers, while the cattle strip the vines of leaves as high as they can reach. I have forwarded a few tubers to the Agricultural Chemist for analysis. In all probability a short description may be of interest to readers of the "Agricultural Journal."

The yams are the root tubers of *Vitis opaca*, a species of native grape common in coastal Queensland. The plant is very variable in the shape of its leaves and in the size of the tubers produced, and it is possible that several distinct forms or races occur. The yams sometimes attain a very large size; one collected near Redcliffe by Mr. E. W. Bick turned the scale at a little over 20 lb. weight. In the early days the yams were said to be eaten, both raw and cooked, by the aborigines. They have, however, comparatively little actual food value, as the following analysis by the Agricultural Chemist (Mr. J. C. Brunnich) shows:—

ANALYSIS OF SCRUB YAM (*VITIS OPACA*).

	Per cent.
Moisture	95.0
Crude Protein	0.75
Carbohydrates	2.23
Crude Fibre	1.08
Crude Fat	0.02
Ash	0.92

The vine also occurs in New South Wales, and is the subject of a paper by Messrs. Baker and Smith in the "Proceedings of the Royal Society of New South Wales," Vol. 40, pages 52-60. Their analysis of tubers from New South Wales plants is much the same as that given by the Agricultural Chemist.

Other Queensland species of *Vitis* produce enlarged tubers or rootstocks; Dr. Roth states that those of *Vitis acetosa* are hammered on stones and then roasted by the natives about Princess Charlotte Bay. He also states that the tubers of *Vitis trifolia*, another tropical species, are "roasted on the ashes lying over heated ant-bed 'chunks' or stones. The ashes are subsequently removed, the roots left on the antbeds, &c., and covered with a sheet of tea-tree bark and left to bake. The thick cortical substance is removed before eating." *Vitis clematidea* is a species common along the sea-board of New South Wales and Queensland. It produces tubers which were largely used as food, after cooking, by the aborigines.

RAT ERADICATION.

Another effective method of exterminating rats is described in the current "Poultry" as follows:—

"Put down a tempting bait and surround it with a ring of caustic soda. Outside the ring of soda place a ring of wet rags or bags. The rat, to reach the bait, must walk over the wet bags, and so wet his feet. He then walks over the caustic soda, which, of course, burns him. He will next lick off the irritating substance, and becomes a dead rat. The same procedure may be adopted at the main entrance to a rat's tunnel. Close up all the holes possible, and put wet rags at the entrance, and soda outside, and then the bait."

Entomology.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (12th November, 1921) from the Entomologist, Mr. Edmund Jarvis:—

"The warmth experienced here during the past few weeks has raised the soil temperature, and so favoured an early transformation of the pupæ of our cane beetle (*Lepidoderma albohirtum*) to the imago or beetle state. The average shade heat between the dates 10th to 17th October was 84 degrees Fahr., a temperature exceeding, indeed, that which normally obtains during our summer months. Such conditions being accompanied by a precipitation of 2.79 in. of rain, it seemed likely that about 50 per cent. of the beetles might make an early emergence. Apparently, however, this heat has not been sufficient to arouse them from a torpid state, as up to the present (28th October) no decided emergence has taken place. The past winter having been somewhat cooler than usual, it is quite possible that the beetles may not appear until early in November.

"CONDITIONS AT GREENHILLS.

"The cane on this estate, which at present consists of about 160 acres of ratoon and 90 of plant cane, is making splendid growth, the September planting being already about 3 ft. high. Mr. Hoelscher, the manager, is experimenting against the grub by burying a layer of trash directly underneath the cane, the trash being first placed in a trench, and covered by a layer of soil, on top of which the 'sets' are then planted in the usual manner. Several rows have been treated in this way, and a number of the adjoining rows left untreated to act as a check plot. About 600 acres are to be placed under Mauritius beans, one-third of this area having already been sown. The whole of the crop will be ploughed under in due course, and followed by cane to be planted early next year, when it is hoped that the grubs may feed on the humus supplied by this green manure and leave the cane alone. At present very few grubs of any sort are showing up in the furrows, and no beetles have been noticed.

"LARGE MOTH-BORER OF CANE.

"This insect, which is sometimes confused with the beetle-borer of cane, is, unfortunately, giving trouble just now in the Lower Burdekin and Bundaberg districts. Growers writing from Rita Island state:—'This pest has gradually become worse until this season, when areas in one patch have been destroyed.' 'They are very bad on my farm this year, attacking the young plant cane as soon as it is out of the ground; they clean out patches completely. They are also bad on the adjoining farms.' The larva of this moth-borer (*Phragmatiphila truncata* Walk.) does not in the least resemble that of the beetle-borer, the former being a slender caterpillar about 1½ in. long, while the latter is a plump maggot-shaped grub. The moth-borer usually attacks young ratoons and plant cane, killing the central unfolding leaves, which quickly wilt and turn brown, such plants finally exhibiting what is termed 'dead-hearts.' When occurring in big cane it is generally found boring the top of the stalk. The beetle-borer, however, seldom attacks very young shoots, and when infesting mature cane is most often seen tunnelling the basal portion.

"The moth-borer is common here in canefields, but appears to be effectively controlled by natural enemies, amongst which the well-known ant, *Pheidole megacephala*, may be considered as being an important factor. The writer has also bred from parasitised caterpillars found in bored cane at Pyramid, a tachinid fly, and a braconid wasp parasite, *Apanteles nonagrinæ*. The latter insect has previously been described as a parasite of this moth-borer in New South Wales, but has not, I believe, been recorded hitherto from Queensland.

"Judging by reports to hand regarding the mode of attack manifested by this pest on the Lower Burdekin, it appears likely that two at least of the abovementioned natural enemies do not occur there.

"We intend, therefore, to collect specimens of the parasites in question at Pyramid, and, upon obtaining same, breed them here until getting a sufficient number to convey to Rita Island for liberation on plantations where this borer is troublesome. A special breeding-cage, including about 90 cub. ft. of space, is being constructed for this work, and will contain cane plants growing naturally in soil about 9 in. deep, in order to secure ideal conditions for breeding these parasites.

"CONTROL OF THE ADULT BEETLE.

"One of the phases of control we propose investigating this coming season is that of poisoning the adult beetles before they have had time to oviposit. Experimentation in this connection will include field as well as laboratory work. Beetles will be confined separately in cages containing favourite food-plants which have been sprayed with various poisons, while feeding-trees in the forest will also be treated with similar arsenical solutions.

"Preliminary experiments of this nature were initiated by the writer in 1915 ('Australian Sugar Journal,' Vol. VII., page 62) when it was found that arsenate of lead-molasses solution proved fatal after nine days, during which time sixty-nine beetles devoured 32 sq. in. of the poisoned leaves (about ½ sq. in. to each insect). This spray, although slow in taking effect, would, nevertheless, be serviceable if administered to beetles directly they appear, as a period of about fourteen days elapses between emergence and oviposition. It is hoped, however, to discover an insecticide this season that will prove fatal in a week or less.

"It may be mentioned in this connection that amongst the numerous native food-plants of albohirtum there are two which invariably attract great numbers of beetles, viz.:—*ficus pilosa* and *ficus nesophila*. Growers who intend to collect beetles invading their canefields could not do better than plant clumps of three or four of these fig-trees on headlands or among their cane at convenient distances apart. Such trap-trees should be pruned occasionally in order to keep the heads low and spreading; and could either be collected from during the flighting season or sprayed with some suitable arsenical upon the first appearance of the beetles. Cuttings were taken from both these figs a few months back in order to see if they could be easily propagated, some being root-grafted in the ordinary way and the remainder planted without special treatment. Both methods proved successful, and I had no difficulty in 'striking' a larger percentage of these cuttings. Next season we hope to be in a position to supply young trees of both these figs, free of cost, to any growers who may care to plant them.

"BREEDING OF BORER PARASITES.

"Examination on the 25th instant of cane sticks that had been artificially stocked with grubs of the weevil-borer, and planted on 14th September in a large breeding-cage, revealed the presence in each stick of pupæ of the tachinid fly, *Ceromasia sphenophori*. These pupæ, which resulted from maggots deposited by flies collected and brought by the writer from Babinda on 22nd September, will produce parasites about the end of this month (October) and constitute our first brood for the season. The life-cycle, from larva to perfect insect, has taken, in the present instance, about forty days, but successive broods should come through during the hot weather in about five weeks. Flies forming the first brood will be used for breeding from, but it is hoped to have specimens available for distribution before next season's cane is old enough to sustain serious injury from borer attack.

"FUMIGATING PUPÆ OF CANE-BEETLES.

"In my August report allusion was made to successful laboratory experiments against the pupæ of albohirtum, our common 'grey-back' cane-beetle. Preliminary field tests conducted during September demonstrated that the fumes of carbon bisulphide are able to penetrate the walls of the pupal chamber, and injections made at a depth of 8 in. proved fatal to pupæ lying at an average depth of 11 in. Owing to prolonged wet weather these experiments had to be discontinued, but the matter will be followed up next season with view to securing further data.

"MULGRAVE NOT COLLECTING BEETLES.

"At a meeting of the Cairns Cane Growers' Association, held at Gordonvale on the 25th instant, the Mulgrave growers decided not to collect beetles or grubs this season. Such action is very regrettable, and it is to be feared that, in the event of dry weather obtaining during the period occupied by the third stage of the grub, many growers may suffer serious losses. The emergence of albohirta last season was the biggest yet observed by the writer during the past seven years, but, unfortunately, prolonged wet conditions promoted rapid growth, and in many cases the cane had attained a good length before the grubs were large enough to do much damage. Again, later on, during the critical period showers and cloudy days kept the tops green, and sticks that had fallen were able to root afresh and keep alive until crushing time. Judging from past experience in this and other countries, we may reasonably infer that cane-beetles are likely to appear this season in very great numbers."

General Notes.

WHEAT BOARD ELECTIONS.

The election of representatives on the Wheat Board, held on 26th November, resulted as follows:—

No. 1 DISTRICT.

Primary Votes.

McKeon	56 votes
Ashmore	31 „
McAnnally	125 „
Swan	257 „
Informal	7 „
Total	476 „

Number of ballot-papers issued .. 661
Percentage of electors .. 72 per cent.

As Mr. Swan therefore secured an absolute majority in the primary count, there was no necessity to count the contingent votes.

No. 2 DISTRICT.

Mr. Harvey was returned unopposed.

No. 3 DISTRICT.

Primary Votes.

Angus	23 votes
Mahony	55 „
White	85 „
Head	110 „
Kirkegaard	193 „
Informal	16 „
Total	492 „

Number of ballot-papers issued .. 657
Percentage of electors .. 74.9 per cent.

As no candidate received an absolute majority of votes, the three lowest candidates—Messrs. Angus, Mahony, and White—were struck out in accordance with the regulations governing the ballot, and the counting of their contingent votes resulted as follows:—

Angus's votes—	
For Kirkegaard	8
For Head	7
Mahony's votes—	
For Head	8
For Kirkegaard	21
White's votes—	
For Head	27
For Kirkegaard	22
Total for Kirkegaard	51
Total for Head	42

This, added to the former totals of Messrs. Kirkegaard (193) and Head (110), made the final totals of these gentlemen as follows:—

Kirkegaard	244
Head	152

Mr. Kirkegaard, therefore, being duly elected with a majority of 92.

No. 4 DISTRICT.

Primary Votes.

Muir	276 votes
Russell	126 „
Keable	118 „
Roche	122 „
Informal	6 „
Total	648 „

Number of ballot-papers issued 821
Percentage of electors .. .. 78.9 per cent.

As, therefore, no candidate received an absolute majority of votes, the two lowest candidates were again struck out, and the counting of their contingent votes resulted as follows:—

Keable's votes—		
For Muir	47	
For Russell	13	
Roche's votes—		
For Muir	46	
For Russell	12	
Total for Muir		93
Total for Russell		25

These, added to the previous totals of Messrs. Muir and Russell, made the final reading as follows:—

Muir	369
Russell	151

Mr. Muir being, therefore, elected with a majority of 218.

No. 5 DISTRICT.

Primary Votes.

Chamberlain	245 votes
Hart	188 „
Garvey	100 „
Informal	1 „
Total	534 „

Number of ballot-papers issued 764
Percentage of electors .. .. 69.9 per cent.

Again, as no candidate received an absolute majority, it was necessary to cut out Mr. Garvey, the lowest on the list, and the counting of his contingent vote resulted as follows:—

For Chamberlain	26
For Hart	14

making the final totals—

Chamberlain	271
Hart	202

Mr. Chamberlain was, therefore, elected with a majority of 69.

Answers to Correspondents.

"PATTERSON'S CURSE."

"ANXIOUS" (Freestone).—

The Government Botanist, Mr. C. T. White, F.L.S., has identified the weed sent by you as *Echium violaceum*, known in New South Wales as "Patterson's Curse" or "Blue Weed," and in South Australia as "Salvation Jane." It is one of the worst weeds in the Southern States. It has been established in Queensland for some years, but does not seem to spread so rapidly here. It is a native of the Mediterranean, and was probably brought to Australia as a garden flower. Where it makes its appearance, every effort should be made to prevent its spreading. It does not possess any poisonous properties.

HERD TESTING.

L.M. (Millaa Millaa, *viâ* Cairns) asks: "What is the method of determining a fair average test of a cow?"

It is presumed that the word "test" means the percentage of butter-fat contained in the milk of a cow. If such is the case, the average butter-fat content of the milk of the cow may be determined with a fair degree of accuracy by taking, from time to time, what is known as a composite milk sample. A 7-oz. bottle containing added preservative, such as formalin, adding three to four drops to the bottle, is necessary. After milking, the milk should be well mixed by pouring from one vessel to another and the sample drawn immediately, and about ½ oz. of the milk is placed in the composite sample bottle upon each occasion the animal is milked. At the end of the week the milk sample bottle will be filled with milk, and the butter-fat content of this milk may be accepted as the average butter-fat content of the milk yield of the animal for the period over which the test extends.

A series of such tests may be made during the lactation of the animal, and, in turn, the average butter-fat content may be obtained from the results thus obtained, and thereby the average butter-fat content of the milk may be arrived at.

RUSSELL RIVER GRASS.

MR. C. HOPKINS (Pomona) writes:—"I am sending for identification specimens of a grass that sprung up at a place where I unloaded banana suckers from North Queensland. The grass is eagerly eaten by stock, and seems to be hardy, as it holds its own with other grasses and weeds."

The grass has been identified by the Government Botanist, Mr. C. T. White, F.L.S., as the Russell River Grass (*Paspalum paniculatum*), a species widely spread over the tropical regions of the world, and very abundant on the Atherton Tableland, Russell River, Johnstone River, and other parts of North Queensland. Opinions in the North differ as to its fodder value. On the Atherton dairy country it is looked upon as more or less a nuisance and of little value as fodder. In other parts, however, it is held to be quite a useful feed. It was boomed as a dairy grass suitable for cultivation some years ago, but did not seem to "take on," and is now rarely seen outside of the tropical regions of the State. It was named by the late F. M. Bailey as a new species (*Paspalum galmarra*), but Mr. White cannot separate it from the widely distributed *P. paniculatum*, an opinion recently verified in a letter from Dr. O. Staph, of the Royal Botanic Gardens, Kew, England, the leading botanical authority on grasses in the world.

Russell River grass should prove a useful grass in Southern Queensland, and would add variety in scrub country where Rhodes and *Paspalum dilatatum* may be said to be almost exclusively grown.

Farm and Garden Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

As the wet season is expected to commence this month, provision should be made accordingly.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstance being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in ths way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tynes set back at an angle to obviate dragging out of plants, but the work should be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture holding capacity of the soil. Planter's Friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

KITCHEN GARDEN.—A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in a covered seed bed, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass,

or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

FLOWER GARDEN.—To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle lift them gently one by one with a knife or a zinc label—*never pull them up by hand,* as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet Fox-hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

Orchard Notes for January.

THE COAST DISTRICTS

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept will worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no

acid phosphate (superphosphate) and only a small percentage of bone meal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more Southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit-fly should receive special attention, and an no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in the handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, both in the Brisbane and Coominya districts, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed and the base pips are beginning to show the first trace of colour. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and over-ripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into tight boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

The advice given in the Notes for December, to send nothing but first-class fruit to market, still holds good. With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry much beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good, firm apples should stand the journey to the Central, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition, is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one sized fruit, of even quality and even colour, in a case, and packing it so that it will carry without bruising, and, when opened up for sale, will show off to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find, when the returns for the sale of his fruit are to hand, that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then "why spoil the ship for the ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That is must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out, a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit-fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail, then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·2	5·34	6·28	5·48	4·58	6·6	4·46	6 28
3	6·1	5·34	5·27	5·48	4·57	6·7	4·46	6·29
4	6·0	5·35	5 26	5·49	4 56	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6 8	4·46	6·31
6	5·58	5·36	5·24	5·50	4·55	6 9	4·46	6·31
7	5·57	5 36	5·23	5·50	4 54	6·9	4·46	6·32
8	5·56	5·37	5·21	5 51	4 53	6·10	4·46	6·33
9	5 54	5·37	5·20	5·51	4·53	6 11	4·46	6·33
10	5·53	5·37	5·19	5·52	4·52	6·11	4·47	6·34
11	5·52	5·38	5·18	5 52	4·52	6·12	4·47	6·35
12	5·51	5 38	5·17	5·53	4·51	6 13	4·47	6·36
13	5 50	5·39	5·16	5·53	4·51	6·14	4 47	6·36
14	5·49	5·39	5·15	5·54	4·50	6·14	4·48	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·46	5 40	5·13	5·55	4·49	6·16	4·48	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·48	6·39
18	5·44	5·41	5 11	5 56	4·49	6·17	4·49	6·39
19	5·43	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6 19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·47	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4 47	6·21	4·51	6·42
23	5·38	5·43	5 6	5·59	4·47	6 22	4·51	6·42
24	5·37	5·44	5·5	6 0	4·47	6 23	4·52	6·43
25	5·36	5·44	5·4	6·0	4·47	6·24	4·52	6·43
26	5 35	5·45	5·4	6·1	4·46	6·25	4·53	6·43
27	5·34	5·45	5·3	6 2	4·46	6 25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·26	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·27	4·55	6·41
30	5·30	5·47	5·0	6 4	4·46	6·27	4·56	6·45
31	...	...	4·59	6·5	...	...	4·57	6·45

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland New South Wales, and Victoria, where th clock time is identical).

			H.	M.
2 Sept.	●	New Moon	1	33 p.m.
9 „	☾	First Quarter	1	30 p.m.
17 „	○	Full Moon	5	20 p.m.
25 „	☽	Last Quarter	7	18 a.m.

Apogee on 14th at 6·0 a.m.
Perigee on 29th at 11·48 p.m.

1 Oct.	●	New Moon	10	26 p.m.
9 „	☾	First Quarter	6	12 a.m.
17 „	○	Full Moon	9	0 a.m.
24 „	☽	Last Quarter	2	32 p.m.
31 „	●	New Moon	9	39 a.m.

Apogee on 11th at 8·54 p.m.
Perigee on 27th at 4·30 p.m.

8 Nov.	☾	First Quarter	1	54 a.m.
15 „	○	Full Moon	11	39 p.m.
22 „	☽	Last Quarter	9	41 p.m.
29 „	●	New Moon	11	26 p.m.

Apogee on 8th at 6·12 a.m.
Perigee on 21st at 7·54 p.m.

7 Dec.	☾	First Quarter	11	20 p.m.
15 „	○	Full Moon	12	50 p.m.
22 „	☽	Last Quarter	5	54 a.m.
29 „	●	New Moon	3	39 p.m.

Apogee on 6th at 1·12 p.m.
Perigee on 18th at 7·36 a.m.

A Total Eclipse of the Sun will occur on 1st October, visible in the South Polar Region and up to a few miles south of Cape Horn.

As a partial eclipse it will be visible in the lower part of South America, but not in Africa or Australia.

The Moon will be eclipsed by the Earth almost totally on 17th October, about 9 o'clock in the morning, when it will be below the horizon in Australia.

As Mercury will be at its greatest distance east of the Sun on 8th October, it should be visible in the west soon after sunset for a fortnight or more. On the 3rd it will be to the left of the Moon, and Venus and Mars will be remarkably in juxtaposition before sunrise.

Saturn and Jupiter will pass almost directly behind the Sun on 22nd and 23rd September, and will be seen only before sunrise from about the middle of October to the end of this year.

On and about 14th November Mars and Saturn will appear to be in close proximity, and Mars and Jupiter on and about 27th November.

Venus also will be a morning star till after the end of the year

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George. Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.